Publisher
Vandana Publications
www.vandanapublications.com

International Journal of Engineering and Management Research

E-ISSN:2250-0758
P-ISSN:2394-6962

Research Article

Generative Artificial Intelligence

2026 Volume 16 Number 4 August

Integrating Generative Artificial Intelligence (GenAI) into Entrepreneurship Education (EE) to Improve Engagement, Higher-Order Thinking, and Entrepreneurial Competencies: A Systematic Literature Review

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DOI:10.31033/IJEMR/16.4.2026.1943

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This systematic literature review (SLR) examines the integration of Generative Artificial Intelligence (GenAI) into entrepreneurship education (EE) from 2021 to 2025, following the PRISMA 2020 framework. Analyzing 34 selected studies, the review addresses four research questions concerning learner engagement and motivation, higher-order thinking, stakeholder perceptions, and entrepreneurial competency development. Findings indicate that GenAI tools-including ChatGPT, Gemini, and other large language models (LLMs)-can meaningfully enhance creative ideation, reflective learning, and opportunity-recognition skills. Simultaneously, the evidence reveals significant concerns regarding algorithmic bias, hallucination risks, data governance, academic integrity, and educator unpreparedness. Critical discussion of contradictory findings reveals that motivational benefits are contingent on pedagogical scaffolding, and that uncritical reliance on AI outputs may impede deep cognitive development. The review concludes that GenAI should function as a cognitively active learning partner rather than a content substitute, and recommends further longitudinal empirical research to evaluate sustainable integration outcomes.

Keywords: Generative Artificial Intelligence (GenAI), Entrepreneurship Education, AI-Assisted Learning, Human–AI Complementarity, Entrepreneurial Competencies, Systematic Literature Review, Algorithmic Bias, Hallucination Risk

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How to Cite this Article

Bhullar T, Chitra M, Sehrawat K, Diksit S, Devi G, Integrating Generative Artificial Intelligence (GenAI) into Entrepreneurship Education (EE) to Improve Engagement, Higher-Order Thinking, and Entrepreneurial Competencies: A Systematic Literature Review. Int J Engg Mgmt Res. 2026;16(4):95-114.
Available From
https://ijemr.vandanapublications.com/index.php/j/article/view/1943

To Browse

Manuscript Received	Review Round 1	Review Round 2	Review Round 3	Accepted
2026-07-15	2026-07-29			2026-08-18

Conflict of Interest	Funding	Ethical Approval	Plagiarism X-checker	Note
None	Nil	Yes	4.65	

1. Introduction

The rapid advancement of Generative Artificial Intelligence (GenAI) technologies has prompted sustained scholarly interest in their educational applications. Entrepreneurship education (EE), which emphasizes creativity, innovation, and digital fluency, represents a domain where this integration carries particular pedagogical significance [1], [2]. As traditional instructional models prove insufficient for preparing learners to navigate AI-permeated entrepreneurial environments, the embedding of GenAI within EE curricula is transitioning from a conceptual aspiration to an institutional imperative [3], [4].

For the purposes of this review, GenAI refers to a class of artificial intelligence systems-including large language models (LLMs) such as ChatGPT and Gemini-capable of producing human-like text, images, and audio through probabilistic generation. This definition is intentionally distinct from narrow AI or rule-based automation systems, which follow pre-specified logic rather than generating novel outputs [5]. Entrepreneurship Education (EE), in turn, refers to structured, multidisciplinary pedagogical processes that equip learners with the knowledge, skills, and dispositions necessary to recognize opportunities, create value, and operate effectively in dynamic, uncertain environments [2], [6].

This paper examines how GenAI tools influence four critical domains: (1) learner engagement and motivation, (2) the development of higher-order thinking skills, (3) student and educator perceptions of GenAI's usability and educational value, and (4) the extent to which GenAI supports entrepreneurial competency development. These domains are addressed through a structured methodology aligned with the PRISMA 2020 framework [7], yielding thematic synthesis and conceptual insights that underpin the subsequent sections.

Critically, this review does not adopt an uncritical advocacy stance toward GenAI. The literature presents contradictory evidence: while motivational and creative benefits are widely reported, equally well-documented concerns include hallucination risks in entrepreneurial decision-making, algorithmic bias in AI-generated content, data governance and privacy vulnerabilities, erosion of cognitive independence, and the inadequacy of existing academic integrity frameworks [3], [8], [9].

These tensions are examined throughout this synthesis, ensuring that the findings reflect the genuine complexity of GenAI integration rather than a uniformly optimistic portrayal. In doing so, this review makes a threefold contribution — theoretical, methodological, and practical — that distinguishes it from prior AI-in-education SLRs, which have largely examined GenAI in general higher education contexts without disciplinary specificity or critical theoretical grounding [6], [10], [11].

2. Review of Literature

The expansion of artificial intelligence across industrial and social domains has fundamentally reconfigured the educational landscape [10], [12]. Within education, AI has emerged as a transformative force capable of challenging entrenched pedagogical paradigms [13]. The emergence of GenAI-typified by systems capable of generating contextually coherent, human-like content-has intensified this transformation [14], [15], [16]. Notably, however, the integration of GenAI within EE has lagged behind its adoption in Science, Technology, Engineering, and Mathematics (STEM) disciplines, leaving a substantive disciplinary gap [6], [17].

2.1 The Need for GenAI in Entrepreneurship Education

Artificial intelligence has penetrated educational systems by enabling personalized learning pathways, adaptive assessment, and instructor support [10], [14]. GenAI in particular introduces capabilities-such as dynamic content generation, scenario simulation, and interactive dialogue-that align closely with the experiential and iterative nature of entrepreneurship education [15], [16]. Despite this alignment, entrepreneurship educators have been slow to incorporate these tools, and the pedagogical literature addressing GenAI in EE remains limited and methodologically fragmented [6], [18].

This gap is rendered more acute by the rapid adoption of AI in entrepreneurial practice. Practitioners already employ AI for venture ideation, market analysis, and strategic planning, creating a growing disconnect between industry norms and classroom preparation [2], [19]. Addressing this disconnect requires not only the adoption of GenAI tools in EE settings but the development of theoretically grounded pedagogical models that guide their purposeful use [17].

However, adoption is not without risk. GenAI systems are known to produce hallucinations-plausible but factually incorrect outputs-which, if uncritically accepted by learners engaged in entrepreneurial decision-making, may lead to flawed business planning or misguided opportunity assessments [5]. This concern is especially salient in EE contexts where students may lack the domain expertise to evaluate AI-generated outputs critically. Moreover, the datasets on which LLMs are trained may embed algorithmic bias, producing outputs that reflect historical inequities in terms of gender, geography, or socioeconomic context [8]. Any pedagogical framework for GenAI integration in EE must explicitly address these risks.

2.2 GenAI and Higher-Order Thinking in Entrepreneurship Education

GenAI tools have been increasingly positioned as cognitive scaffolds capable of facilitating higher-order thinking among learners. Research indicates that when students are prompted to critique, extend, or interrogate AI-generated outputs, they engage in evaluative and analytical reasoning consistent with higher-order cognitive processes as described by Bloom's revised taxonomy [20], [21]. Specifically, studies by [2]. [22] demonstrate that GenAI encourages learners to interrogate assumptions, consider alternative perspectives, and assess the reliability of generated information.

Problem-solving capacity is similarly supported through GenAI-enabled what-if scenario modelling, stepwise deconstruction of complex challenges, and iterative feedback mechanisms [23], [24]. For entrepreneurship students, this translates into enhanced competencies in strategic reasoning, market analysis, and decision-making under uncertainty. Several studies report that learners engaged in GenAI-supported tasks-including business plan development, narrative scripting, and pitch design-demonstrated improved synthesis and creative output [20], [25], [26].

Nevertheless, the cognitive benefits of GenAI are contingent on instructional design. The study by [8] provide systematic evidence that students who engage passively with AI outputs-accepting responses without critical interrogation-demonstrate diminished independent reasoning over time. This phenomenon, termed cognitive offloading, represents a significant risk when GenAI is deployed without metacognitive scaffolding.

The distinction between genuine higher-order thinking stimulated by GenAI and surface-level mimicry of AI fluency remains an underexplored but pressing research priority [9].

Sceptical scholars argue further that framing GenAI as a higher-order thinking tool risks technological determinism — assuming a tool that prompts analytical questions necessarily produces analytical thinkers, while obscuring the mediating roles of pedagogy, learner disposition, and context [27].

2.3 Educator Roles and Teaching Methodologies in the Age of GenAI

Educators stand to gain substantially from the integration of GenAI. Research documents that GenAI can support syllabus construction, formative assessment design, personalised learning pathway development, and the creation of case studies and entrepreneurial simulations [6], [22], [28]. The study done by [29] demonstrate the practical utility of ChatGPT-4 in business model innovation pedagogy, while [2] highlight its capacity to facilitate role-play activities and pitch simulations.

However, educator acceptance is far from uniform. The studies of [3], [30] document apprehension regarding GenAI's accuracy, potential to undermine instructional authority, and tendency to generate hallucinated content that students may uncritically reproduce. Limited AI literacy among faculty, insufficient institutional support structures, and the absence of clear pedagogical integration frameworks further constrain adoption [2], [6]. Critically, educators also express concern that over-reliance on GenAI may diminish the depth of student-teacher mentorship relationships-a relationship that is particularly formative in entrepreneurship education, where guided reflection and experiential coaching are central to learning [26].

Critical educational scholars offer a more structural objection: [27] argues that enthusiasm for AI in education consistently outpaces empirical evidence and serves institutional efficiency over genuine learner development, while [31] cautions that AI mediation threatens the irreducibly human relational dimensions of teaching — concerns of particular weight in entrepreneurship education, where mentorship and identity formation are central to learning.

2.4 Ethical Challenges, Algorithmic Bias, and Data Governance

The capabilities of GenAI to produce high-quality academic content raise serious concerns regarding plagiarism, authorship attribution, and the fairness of evaluation frameworks [9], [14]. As student dependency on AI for assignment completion increases, the capacity of educators to distinguish authentic from AI-assisted work diminishes, destabilizing established integrity frameworks [3], [18].

Beyond academic integrity, the literature raises systemic concerns that are frequently underacknowledged in advocacy-oriented discussions of GenAI in education. First, hallucination risks are especially consequential in EE contexts: students relying on GenAI for market research, financial modelling, or strategic planning may receive confidently stated but factually erroneous information, potentially resulting in flawed entrepreneurial decisions [5]. Second, algorithmic bias in LLMs-stemming from non-representative training data-may produce outputs that disadvantage learners from underrepresented geographic, cultural, or socioeconomic backgrounds, thereby reproducing rather than disrupting structural inequalities in entrepreneurship education [8]. Third, data governance concerns-including questions of student data privacy, consent for AI system training, and institutional liability-remain largely unaddressed in the existing EE literature [9], [30]. These are not peripheral concerns; they constitute fundamental prerequisites for equitable and responsible GenAI integration.

The active debate on whether GenAI enhances or suppresses cognitive independence further illustrates the need for critical synthesis rather than advocacy. Uncritical reliance may engender passive learning, while well-scaffolded integration may amplify genuine intellectual development [3], [10]. Existing institutional frameworks and detection technologies consistently lag behind the sophistication of GenAI outputs, leaving substantive governance gaps [6].

3. This Paper and Approach

The progressive integration of GenAI into educational settings has elicited both enthusiasm and critical scrutiny within the entrepreneurship education community.

Although emerging literature acknowledges the potential of GenAI to support personalization, ideation, and the simulation of real-world entrepreneurial challenges, the empirical synthesis of its effects across key educational domains-learner motivation, cognitive development, stakeholder acceptance, and competency-building-remains limited and methodologically inconsistent. The present paper addresses this gap through a systematic literature review designed to critically evaluate the role of GenAI in entrepreneurship education ecosystems.

This review is explicitly positioned to provide balanced critical synthesis, presenting not only evidence of GenAI's pedagogical promise but also substantive engagement with counter-arguments from anti-AI educational perspectives, risks of hallucination and bias, and the ethical dimensions of algorithmic governance in learning environments.

The paper is structured around four core research questions corresponding to critical themes emerging from the literature: (1) learner engagement and motivation, (2) higher-order thinking and cognitive outcomes, (3) stakeholder perceptions and usability, and (4) entrepreneurial competency development.

3.1 Theoretical Anchoring

The conceptual framework guiding this review is grounded in three established theoretical traditions. First, Bloom's Revised Taxonomy [32] provides the cognitive scaffold for evaluating claims about higher-order thinking, enabling systematic assessment of whether documented GenAI effects correspond to analysis, evaluation, and creation-or merely to recall and comprehension. Second, Self-Determination Theory (SDT) [33] informs the analysis of learner engagement and motivation, specifically distinguishing intrinsic motivational benefits from extrinsically driven compliance with AI tools. Third, the Technology Acceptance Model (TAM) [34] frames the examination of stakeholder perceptions, situating ease of use and perceived usefulness as mediating variables in educator and student adoption of GenAI. Together, these frameworks provide the theoretical scaffolding through which emergent themes from the literature are interpreted and evaluated, ensuring that the conceptual model generated by this review is anchored in established theoretical traditions rather than emerging solely from inductive thematic pattern-matching.

Table 1: Theoretical and Conceptual Frameworks Grounding the Review

Theory / Framework	Origin & Citation	Core Proposition	How It Is Applied in This Review	Research Question Addressed
Bloom's Revised Taxonomy	[32]	Classifies cognitive learning processes into six hierarchical levels: remember, understand, apply, analyze, evaluate, create	Provides the cognitive scaffold for evaluating whether GenAI effects correspond to genuine higher-order thinking (analysis, evaluation, creation) or merely surface-level recall and comprehension	RQ2 — Higher-Order Thinking
Self-Determination Theory (SDT)	[33]	Distinguishes intrinsic motivation (autonomy, competence, relatedness) from extrinsically driven behavior	Frames the analysis of learner engagement and motivation, distinguishing genuine intrinsic motivational benefits of GenAI from instrumental compliance with AI tools	RQ1 — Learner Engagement & Motivation
Technology Acceptance Model (TAM)	[34]	Perceived usefulness and perceived ease of use are the primary mediating variables in user acceptance of technology	Situates educator and student perceptions of GenAI usability, framing ease of use and perceived usefulness as mediating variables in stakeholder adoption	RQ3 — Stakeholder Perceptions
Theory of Planned Behavior (TPB)	[35]	Behavioral intention is determined by attitudes, subjective norms, and perceived behavioral control	Used in included studies to explain digital entrepreneurial intention formation following GenAI adoption among students	RQ1 — Learner Engagement & Motivation
Social Cognitive Career Theory (SCCT)	[35]	Self-efficacy, outcome expectations, and personal goals mediate career and entrepreneurial intention	Applied in included studies to examine how GenAI adoption influences entrepreneurial self-efficacy and digital entrepreneurial intention	RQ4 — Entrepreneurial Competency Development
Stimulus-Organism-Response (SOR)	[1]	External stimuli influence an organism's internal state, which in turn drives behavioral responses	Used in included studies to explain how ChatGPT adoption (stimulus) stimulates digital entrepreneurial intention (response) through motivational mechanisms (organism)	RQ1 — Learner Engagement & Motivation
GAIN Framework	[4]	A structured framework for GenAI-enhanced learning in entrepreneurial contexts, sequencing engagement, application, integration, and navigation	Applied in included studies to structure GenAI-enhanced engagement in entrepreneurship education settings	RQ1 & RQ4 — Engagement & Competencies

Table 1 above demonstrates that theoretical grounding in this review is not limited to the three primary interpretive frameworks (Bloom's Taxonomy, SDT, and TAM) but extends to additional theories employed within the included studies themselves, collectively affirming that the conceptual model emerging from this synthesis is anchored in established scholarly traditions.

4. Identified Research Gap

The existing body of literature on GenAI in entrepreneurship education reveals several interrelated gaps that this review seeks to address. First, longitudinal evidence regarding the sustained effects of GenAI on learner engagement and entrepreneurial intention is almost entirely absent, with existing studies predominantly capturing short-term or cross-sectional outcomes [18], [4].

Second, the distinction between genuine higher-order cognitive development and surface-level task completion facilitated by AI fluency remains empirically underexplored; most studies report output quality rather than cognitive transformation [8], [9]. Third, educator perspectives on GenAI's pedagogical value and ethical risks remain disproportionately underrepresented relative to student-centred studies, limiting insight into the institutional dimensions of adoption [3], [29]. Fourth, standardised frameworks for assessing entrepreneurial competency development in AI-supported environments are conspicuously absent, rendering cross-study comparison and cumulative knowledge-building difficult [2], [19]. Fifth, the ethical dimensions of GenAI integration-including hallucination risks, algorithmic bias, and data governance-receive only peripheral treatment in EE-focused literature, despite their centrality to equitable and responsible deployment.

This review fills a distinct niche in the existing landscape of AI-in-education SLRs. While prior reviews such as [6] and [10] examine GenAI in broader educational contexts, the present review focuses specifically on entrepreneurship education as an experiential, competency-driven discipline with unique pedagogical requirements. Unlike general educational AI reviews, this SLR maps GenAI evidence onto the specific competency domains of entrepreneurship education-opportunity recognition, creative ideation, strategic decision-making, and ethical judgment-while simultaneously engaging critical counter-arguments and under-examined risks. The novel synthesis offered here advances understanding across three dimensions: theoretically, through the integration of Bloom's Revised Taxonomy, Self-Determination Theory, and the Technology Acceptance Model as interpretive frameworks; methodologically, through the application of PRISMA 2020 and ROBIS assessment specifically within the EE domain — a combination not employed in prior comparable reviews; and practically, by providing evidence-based guidance for EE practitioners, curriculum designers, and institutional policymakers navigating responsible GenAI adoption. Notably, while [19] address GenAI in entrepreneurship research and practice broadly, the present review is distinctive in its exclusive focus on the educational and pedagogical dimensions of GenAI integration within EE, its critical engagement with anti-AI perspectives, and its competency-domain mapping approach.

5. Research Questions Emanating from the Evaluation

Table 2: Research Questions Arising from Systematic Literature Review

Research Question (RQ)	Purpose
RQ1: How does GenAI (e.g., ChatGPT) influence learner engagement and motivation in entrepreneurship education?	To examine the influence of GenAI on student participation, enthusiasm, and learning outcomes across entrepreneurship education contexts.
RQ2: How effective is GenAI in fostering higher-order thinking (critical thinking, creativity, reasoning)?	To explore GenAI's capacity to stimulate higher-order cognitive skills-including analysis, evaluation, and creation-in learners of entrepreneurship education.
RQ3: How do students and educators perceive the usability and value of GenAI in entrepreneurship education?	To explore attitudes, trust, ease of use, and behavioral intentions of key stakeholders in entrepreneurship education regarding GenAI tools.
RQ4: Can GenAI tools support the development of entrepreneurial competencies?	To analyze how GenAI supports opportunity recognition, creative ideation, and problem-solving among entrepreneurship students.

6. Methodology

This study adopts a systematic literature review (SLR) methodology, following the PRISMA 2020 framework-Preferred Reporting Items for Systematic Reviews and Meta-Analyses [7]-to ensure transparency, replicability, and methodological rigour. The objective is to synthesise peer-reviewed scholarly evidence published between January 2021 and March 2025 on how GenAI tools influence learner engagement, higher-order thinking, stakeholder perceptions, and entrepreneurial competency development.

6.1 Search Strategy

Searches were conducted across seven databases: Google Scholar, ERIC (Education Resources Information Center), IEEE Xplore, SSRN, SpringerLink, Elsevier ScienceDirect, and ResearchGate. The last search was conducted on 15 March 2025. Boolean search strings were constructed using the following combinations:

- "Generative AI" AND "Entrepreneurship Education"
- "ChatGPT" AND "Entrepreneurial Learning"
- "GenAI" AND "Entrepreneurship Education"

- "Large Language Model" AND "Entrepreneurship"
- "Artificial Intelligence" AND "Entrepreneurship Pedagogy" AND "Higher Education"

Forward and backward citation tracking was not performed systematically due to resource constraints; however, key foundational references identified through database searches were manually traced in selected high-impact studies to capture seminal works not indexed within the 2021-2025 window.

6.2 Inclusion and Exclusion Criteria

Table 3: Search Strategy and Inclusion/Exclusion Criteria

Category	Details	Additional Information
Databases Used	Google Scholar; ERIC; IEEE Xplore; SSRN; SpringerLink; Elsevier ScienceDirect; ResearchGate	Multi-database search to ensure comprehensive coverage across education, technology, and business disciplines.
Keywords Used	Boolean combinations: "Generative AI" AND "Entrepreneurship Education"; "ChatGPT" AND "Entrepreneurial Learning"; "GenAI in Entrepreneurship Education"; "LLM" AND "Entrepreneurship"	Boolean operators (AND, OR) were applied consistently across all databases.
Language	English only	Non-English publications were excluded to ensure consistency of interpretation.
Time Range	January 2021 - March 2025	Time frame selected to capture literature aligned with the emergence of modern GenAI systems (e.g., GPT-3 onwards).
Inclusion Criteria	Peer-reviewed journal articles, conference papers, and working papers; full-text PDF available; explicit focus on GenAI or LLMs in educational or entrepreneurial settings; empirical, theoretical, or systematic contributions.	In limited cases, papers with restricted full-text access were retained if abstract and metadata provided unambiguous relevance to the research questions.
Exclusion Criteria	Editorials, opinion blogs, or commentary without empirical or theoretical grounding; non-English publications; studies unrelated to education or entrepreneurship; publications before 2021.	

6.3 Screening and Study Selection

The search yielded approximately 60 initial records. Following deduplication, 50 records remained. Abstract and title screening reduced this to 34 records assessed for relevance. Full-text access was available for 26 papers, which were included as primary sources for detailed empirical analysis. For the remaining 8 papers, information was extracted from abstracts and publicly accessible metadata to inform conceptual mapping. These partial-access studies contributed to thematic pattern identification but were not used as sources of detailed empirical evidence.

Table 4: PRISMA Flow Summary

Step	Description	Count
Records identified	From databases and repositories	~60
After duplicate removal	Remaining after deduplication	50
Screened by title/abstract	Records assessed for relevance	34
Full-text articles assessed	Full-text PDFs available and reviewed	26
Partial-text articles included	Abstract and metadata-only records with relevant insights	8
Systematic reviews included	Systematic literature reviews contributing to synthesis	3
Other review types	Scoping review and umbrella review used for conceptual input	2
Total studies included	Used in synthesis, conceptual framework, and thematic analysis	34

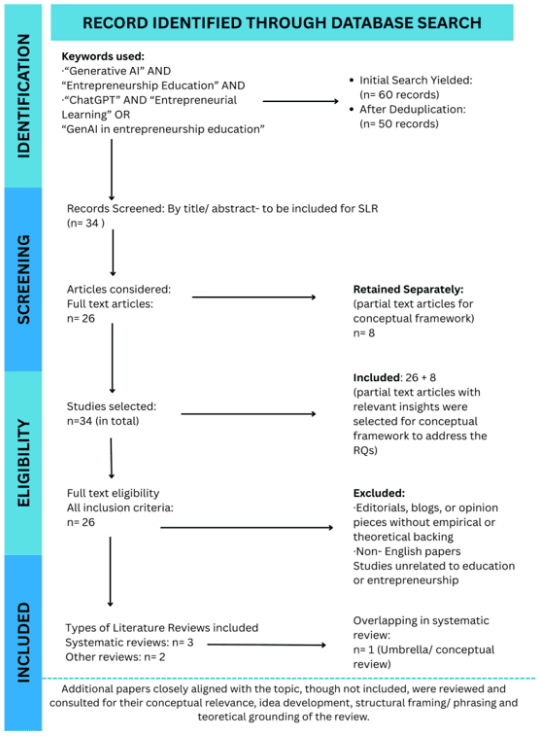

Figure 1: PRISMA Flow Chart Depicting Study Selection and Inclusion Process. Source: Authors' own elaboration.

6.4 Clarification on Reference Selection and Usage

A total of 45 references are cited across this paper. Of these, 34 studies were systematically reviewed according to the predefined inclusion criteria (full-text availability, relevance to GenAI in EE, and publication within 2021-2025). The remaining 11 references serve three distinct and methodologically transparent purposes: (1) they provide remaining 11 references serve three distinct and methodologically transparent purposes: (1) they provide theoretical context and historical background necessary to situate the systematic evidence within the broader literature; (2) they guide the methodological framing of the review design itself; and (3) foundational works published prior to 2021-including theoretical frameworks such as Bloom's Revised Taxonomy, Self-Determination Theory, and the Technology Acceptance Model-are cited to ground the conceptual scaffolding of the review. This distinction between systematic evidence sources and contextual references is maintained throughout the paper to preserve methodological clarity. The reference list is alphabetically ordered in full APA 7th Edition format, with DOIs provided where available.

6.5 Data Extraction and Conceptual Framework Development

A structured data extraction matrix was applied to each included study, documenting: author(s) and year of publication; type of AI tool examined (e.g., ChatGPT, Gemini, DALL-E); educational context and entrepreneurial scenario; research methodology; and core findings or theoretical contributions. Studies were then mapped against the four research questions to support thematic synthesis. The conceptual framework constructed from this process is theoretically anchored in Bloom's Revised Taxonomy, Self-Determination Theory, and the Technology Acceptance Model, as elaborated in Section 3.1.

6.6 ROBIS Assessment-Risk of Bias in Systematic Reviews

The ROBIS tool was applied to assess the integrity and transparency of the review process across three phases.

Phase 1 - Assessing Relevance: The review addressed a clearly focused set of research questions and employed explicit eligibility criteria aligned with the study's scope. Phase 2 - Concerns with Review Process is summarized in Table 4. Phase 3 - Overall Judgment: The overall risk of bias is assessed as low to moderate. The review followed a transparent and systematic process. Limitations include single-reviewer screening, the partial inclusion of abstract-only records, and the absence of a formal quality appraisal tool for individual studies.

Table 5: Phase 2 ROBIS Domain Assessment

Domain	Assessment Question	Assessment and Justification
Study Eligibility Criteria	Were eligibility criteria clearly defined and appropriate?	Yes - Inclusion/exclusion criteria based on time frame, topic relevance, language, and access were explicitly stated.
Identification and Selection of Studies	Was the search strategy comprehensive and appropriate?	Probably Yes - Multi-database search was conducted; single-reviewer screening poses a methodological limitation.
Data Collection and Appraisal	Were data extraction and quality appraisal appropriate?	Probably Yes - Data extraction was systematic; no formal appraisal tool was applied to individual study quality.
Synthesis and Findings	Was synthesis appropriate and supported by data?	Yes - Thematic synthesis was conducted according to four predefined research questions.

6.7 Conceptual Foundation for Addressing Research Questions

Table 5 maps key findings and scholarly debates to the four research questions, illustrating how the literature collectively informs each thematic domain.

Table 6: Conceptual Tabulation Addressing Research Questions

Research Question (RQ)	Mapped Insights and Supporting Evidence from Literature
RQ1: Learner Engagement and Motivation	[1]and [35] report that ChatGPT adoption stimulates digital entrepreneurial intention. [25] demonstrate improved student exploration and engagement through AI-assisted discovery learning. [4] articulates the GAIN Framework's role in structuring GenAI-enhanced engagement. Motivational benefits are contingent on pedagogical scaffolding; risks of passive reliance and reduced independent effort are documented [3], [8].

RQ2: Higher-Order Thinking	[20] show ChatGPT supports narrative script development and complex thinking. [9] highlight reflective questioning as a mechanism for critical engagement. [36] document AI-enhanced creativity and decision-making. Counter-evidence: [8] demonstrate that over-reliance on AI may impede deep reasoning; surface-level mimicry of AI fluency is documented as a risk [5].
RQ3: Stakeholder Perceptions	[37] report positive student attitudes toward GenAI usability. [29] document educator value of ChatGPT-4 in business model innovation. [30] raise ethical concerns and propose a trust governance framework. [3] document both enthusiasm and scepticism, particularly regarding academic originality and instructor authority.
RQ3: Stakeholder Perceptions	[37] report positive student attitudes toward GenAI usability. [29] document educator value of ChatGPT-4 in business model innovation. [30] raise ethical concerns and propose a trust governance framework. [3] document both enthusiasm and scepticism, particularly regarding academic originality and instructor authority.
RQ4: Entrepreneurial Competency Development	[18] and [38]) argue that GenAI strengthens problem-solving and opportunity recognition. [2] link GenAI to skill-based venture creation. [36] identify AI-enhanced decision-making competencies. Key gap: absence of standardised metrics to assess competency outcomes in AI-supported EE environments [19].

7. Addressing the Research Questions

7.1 RQ1: GenAI and Learner Engagement and Motivation

Purpose: To examine the influence of GenAI on student participation, enthusiasm, and learning outcomes across entrepreneurship education contexts.

GenAI tools such as ChatGPT enhance learner engagement by creating interactive, personalized, and real-time feedback environments. When students employ AI to simulate entrepreneurial scenarios, generate business plan drafts, or conduct rapid market analyses, their sense of agency and ownership over the learning process increases-both of which are consistent with intrinsic motivation as conceptualized within Self-Determination Theory [33]. The immediacy and responsiveness of GenAI systems lower the cognitive entry barrier for entrepreneurial ideation, enabling learners to test ideas iteratively in low-stakes environments that mirror authentic entrepreneurial practice [1], [4], [25].

However, the motivational benefits of GenAI are neither universal nor unconditional. Evidence presented by [3] and [8] cautions that without structured pedagogical scaffolding, students may become instrumentally dependent on AI outputs, reducing independent cognitive effort and diminishing the quality of long-term engagement. The novelty effect-where initial enthusiasm for AI tools dissipates over time-has also been noted in the broader educational technology literature [39]. Critically, motivational gains are most robustly documented in contexts where GenAI is deployed as a co-creative tool embedded within goal-oriented instructional strategies, rather than as a standalone productivity accelerator.

From a critical standpoint, however, framing GenAI as a motivational tool risks instrumentalizing learning — cultivating engagement with AI-driven stimuli rather than the intrinsic entrepreneurial curiosity and risk disposition that authentic venture development demands [27], [31].

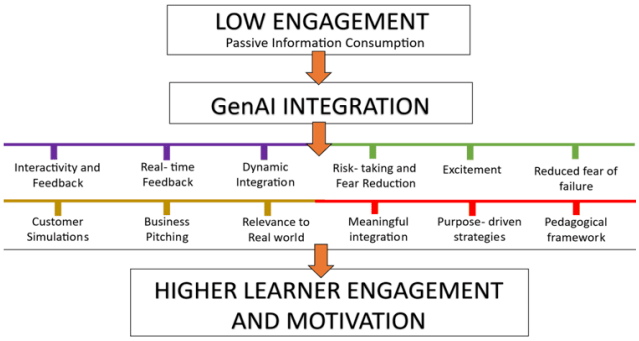

Figure 2: Enhancement of Learner Engagement and Motivation in Entrepreneurship Education via GenAI. Source: Authors' own elaboration.

7.2 RQ2: GenAI and Higher-Order Thinking

Purpose: To explore GenAI's capacity to stimulate higher-order cognitive skills in learners of entrepreneurship education.

When students are prompted to evaluate, critique, and extend AI-generated outputs, they engage cognitive processes corresponding to the analysis, evaluation, and creation levels of Bloom's Revised Taxonomy [32]. The interactive dialogue format of tools such as ChatGPT can cultivate reflective thinking by encouraging learners to justify decisions, interrogate underlying assumptions, and consider alternative strategic scenarios [20], [40]. Students engaged in rapid business model prototyping, pitch development,

and entrepreneurial narrative scripting using GenAI demonstrate improvements in synthesis and complex reasoning [2], [25], [26].

Nevertheless, the evidence also supports a critical counter-position. [8] provide systematic evidence that passive engagement with AI outputs-without instructional prompting for metacognition and reflection-reduces students' independent problem-solving capabilities over time. The phenomenon of cognitive offloading, wherein learners delegate reasoning processes to AI systems rather than internalising them, represents a structural risk when GenAI is deployed without carefully designed instructional boundaries. [9] further observe that students may reproduce the rhetorical fluency of AI-generated content without developing corresponding depth of analytical reasoning-mimicking the appearance of higher-order thinking rather than engaging in it substantively. These counter-arguments from anti-AI educational perspectives are not marginal dissents; they constitute empirically grounded cautions that must inform the design of any GenAI-integrated EE curriculum.

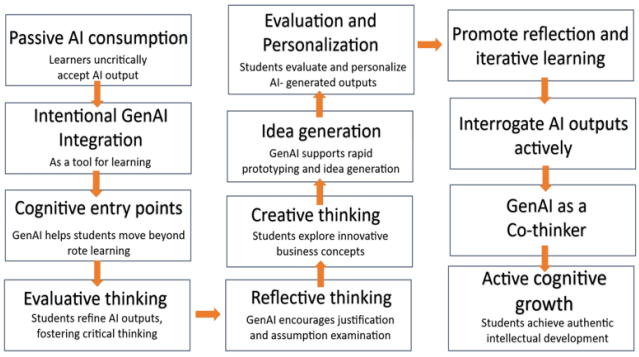

Figure 3: GenAI's Role in Cultivating Higher-Order Thinking in Entrepreneurship Education. Source: Authors' own elaboration.

7.3 RQ3: Stakeholder Perceptions and Usability

Purpose: To explore attitudes, trust, ease of use, and behavioural intentions of key stakeholders in entrepreneurship education regarding GenAI tools.

Applying the Technology Acceptance Model [34] as an interpretive lens, the evidence reveals a structured pattern in stakeholder perceptions. Students generally perceive GenAI as useful and easy to use, appreciating its capacity to support brainstorming, draft generation, and idea refinement, particularly during the early stages of business plan development [37].

The 24/7 availability of GenAI tools enhances perceived academic self-efficacy and reduces the friction associated with initial ideation tasks.

Educators, however, approach GenAI with considerably more caution. The study of [3] and [29] document a dual attitude among faculty: acknowledgement of GenAI's pedagogical potential alongside apprehension about academic integrity erosion, AI literacy deficits, and the lack of institutional governance frameworks. [30] propose an ethical data mining framework as one structured response to these governance concerns. Critically, trust in GenAI outputs among educators is further undermined by the documented risk of hallucination: AI systems may produce contextually plausible but factually incorrect information that students accept uncritically, particularly in domain areas where learners lack sufficient prior knowledge to evaluate AI outputs independently [5].

The absence of clear institutional guidelines, structured faculty training programmes, and formal AI literacy curricula contributes to inconsistent and often pedagogically misaligned applications of GenAI across EE contexts [6]. Sustainable stakeholder acceptance will require co-design processes involving both educators and students in developing governance frameworks that are simultaneously purpose-driven, ethically grounded, and pedagogically coherent. Selwyn (2019) cautions, however, that stakeholder co-design processes are often performative — shaping surface features of AI implementation while leaving the underlying logic of technological solutionism unexamined.

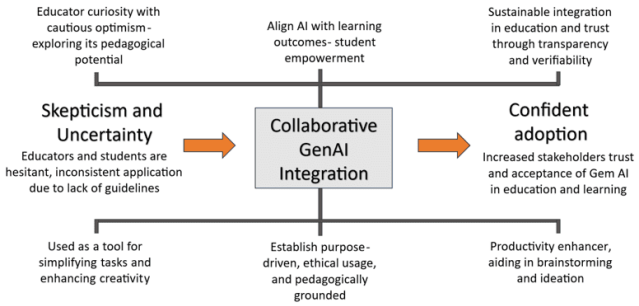

Figure 4: Stakeholder Perceptions of GenAI Integration in Entrepreneurship Education. Source: Authors' own elaboration.

7.4 RQ4: Entrepreneurial Competency Development

Purpose: To analyze how GenAI supports opportunity recognition, creative ideation, and problem-solving among entrepreneurship students.

When deployed purposefully, GenAI demonstrates meaningful capacity to support the development of core entrepreneurial competencies. In the domain of opportunity recognition, GenAI enables students to explore business ideas across multiple dimensions-trend analysis, market gap identification, feasibility assessment-using data-driven generation and iterative dialogue to sharpen analytical precision [2], [18]. The iterative prompting format of tools like ChatGPT encourages students to continually reframe and refine their entrepreneurial propositions, a process consistent with the hypothesis-testing mindset central to entrepreneurial cognition [36].

Creative ideation is similarly enriched through GenAI-enabled brainstorming, analogy generation, and rapid prototyping of business concepts. [20] and [25] demonstrate that AI-assisted discovery learning environments foster original business concept exploration and creative synthesis. Problem-solving competencies are strengthened through structured what-if scenario analyses, simulated stakeholder interactions, and real-time feedback mechanisms that develop strategic adaptability in low-risk learning environments [41], [23].

However, competency development through GenAI is not automatic. Without intentional instructional guidance, students may engage with AI in a superficial manner-generating outputs rather than developing the underlying cognitive and dispositional competencies that characterize entrepreneurial capability [8]. Furthermore, the absence of standardized, validated metrics for assessing entrepreneurial competency development in AI-supported settings constitutes a significant methodological gap that limits the ability to draw definitive conclusions about the magnitude and durability of GenAI's contribution to competency-building [19]. Competency-based learning frameworks that incorporate reflective checkpoints, peer critique, and staged autonomy reduction are necessary to ensure that GenAI functions as a catalyst for genuine skill internalization rather than a proxy for competency demonstration.

A critical but underexamined risk specific to entrepreneurial competency development is GenAI hallucination — the generation of plausible yet factually incorrect outputs — which, if uncritically incorporated into business plans or opportunity assessments, may produce fundamentally flawed venture decisions [5].

Educators must therefore embed explicit AI output verification skills into competency-based frameworks as a non-negotiable component of responsible GenAI use.

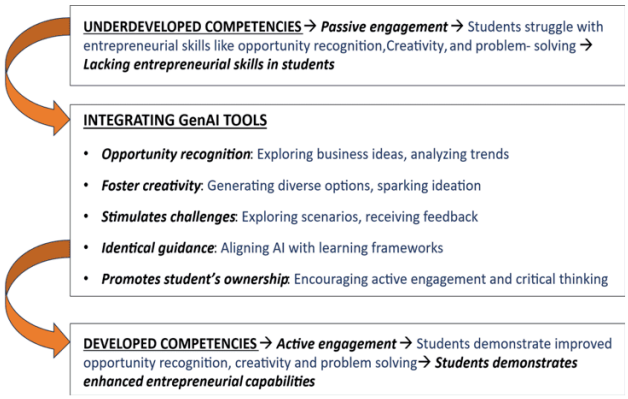

Figure 5: GenAI's Role in Enhancing Entrepreneurial Competencies through Guided Integration. Source: Authors' own elaboration.

8. Data Analysis and Interpretation

8.1 Overview of Included Studies

The systematic literature review incorporated 34 academic studies published between 2021 and 2025, comprising 26 full-text articles and 8 partial-access papers used for conceptual insights. The corpus spans diverse geographies-including the United States, Germany, Vietnam, Southeast Asia, India, and Latin America-as well as varied methodological approaches, encompassing empirical surveys, experimental designs, case analyses, and systematic and scoping reviews. The analysis was organised around the four core research questions constituting the thematic pillars of this review.

8.2 Thematic Analysis Based on Research Questions

Table 7: Cross-Cutting Patterns Identified Across Thematic Domains

Cross-Cutting Pattern	Core Finding	Implication for EE Practice	Supporting Evidence
Benefits are conditional, risks are universal	GenAI's motivational, cognitive, perceptual, and competency benefits are contingent on instructional design quality; its risks — passive reliance, cognitive offloading, hallucination, algorithmic bias, and integrity erosion — are present regardless of context	GenAI cannot be deployed without structured pedagogical scaffolding; risk mitigation must be treated as a prerequisite, not an afterthought	[3], [4], [8], [9], [30]
Pedagogy matters more than the tool	The critical variable in GenAI integration is not the tool itself but the pedagogical framework within which it is deployed	Institutional investment should prioritise framework design and educator training over tool procurement	[2], [3], [6]
Student–educator perception asymmetry	Students consistently report positive usability and self-efficacy gains; educators present a more ambivalent profile shaped by governance concerns and integrity anxieties	Sustainable adoption requires distinct intervention strategies for students and educators — one cannot substitute for the other	[3], [29], [37]
Critical evidence gaps limit conclusions	Longitudinal evidence and validated competency assessment frameworks are almost entirely absent, limiting the ability to draw firm conclusions about the durability and depth of GenAI's educational effects	Future research must prioritise longitudinal designs and standardised outcome measures before definitive recommendations can be made	[4], [18], [19]

8.3 Visual Thematic Summary

Table 8: Thematic Summary of Studies Included in the Systematic Literature Review

Theme	No. of Studies	Review Types	Core Tools Examined
Learner Engagement and Motivation	11	Empirical (8), Review (3)	ChatGPT, Gemini
Higher-Order Thinking	10	Empirical (6), Conceptual (2), Review (2)	ChatGPT, LLMs
Stakeholder Perception and Usability	8	Mixed Methods (4), Review (2), Conceptual (2)	ChatGPT, Bard/Gemini
Entrepreneurial Competency Development	12	Empirical (7), Conceptual (3), Review (2)	ChatGPT, GenAI platforms

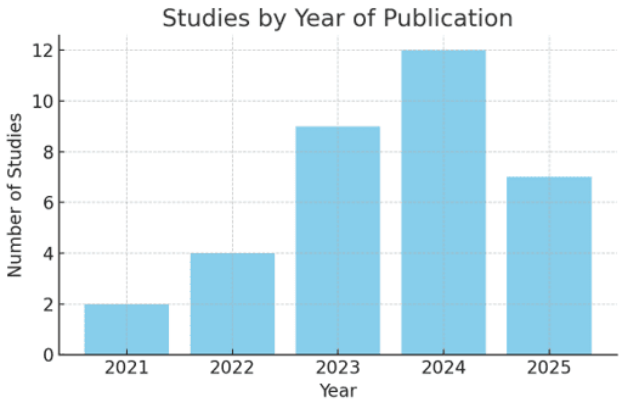

Figure 6: Distribution of Included Studies by Publication Year (2021-2025). Source: Authors' own elaboration.

Table 9: Geographical Distribution of Included Studies by Region (n = 34)

Region	Countries Represented	No. of Studies	Primary Thematic Focus	Key Sources
Western Europe	UK, Italy, Germany, Netherlands, Norway, Sweden, Finland, Bulgaria	9 (26%)	Pedagogical integration, ethical governance, academic integrity, institutional policy frameworks	[5], [9], [29], [18], [19]
Southeast Asia	Vietnam, Indonesia, Philippines	7 (21%)	Motivational amplification, resource compensation, student engagement, digital entrepreneurial intention	[1], [16], [25], [30]
North America	USA	4 (12%)	Pedagogical design, entrepreneurial competency development, educator readiness	[2], [3], [36], [42]
Oceania	Australia	3 (9%)	Cognitive dependency risks, paradoxical AI impact, scoping review methodology	[6], [8], [39]
East Asia	China	3 (9%)	Technology acceptance, regulatory ethics, LLM capability in EE	[15], [21], [37]
South Asia	India, Pakistan	2 (6%)	AI adoption in EE, digital readiness, business education applications	[12], [43]
Middle East	Saudi Arabia, UAE	2 (6%)	Educational AI applications, LLM-based entrepreneurship knowledge	[10], [40]
Sub-Saharan Africa	Ghana, Nigeria	2 (6%)	AI-enhanced teaching, science entrepreneurship education	[14], [45]

Latin America	Mexico	1 (3%)	AI-assisted scientific entrepreneurship, complex thinking development	[20]
Eastern Europe	Bulgaria	1 (3%)	AI impact on EE, pedagogical transformation	[45]
Total		34 (100%)		

Note: Western Europe and Southeast Asia together account for 47% of included studies (n = 16), reflecting both the maturity of AI-in-education research in European institutional contexts and the rapid growth of GenAI adoption studies in Vietnamese, Indonesian, and Philippine higher education. Multi-authored studies spanning multiple national contexts are coded by the primary institutional affiliation of the lead author. Regional characterisations reflect descriptive thematic patterns only; effect-size comparisons across regions are not feasible in this SLR due to the methodological heterogeneity of included studies (spanning experimental, survey, conceptual, and review designs) and the absence of standardised outcome measures. Future research employing comparable methodological designs across national contexts would substantially strengthen cross-regional evidence.

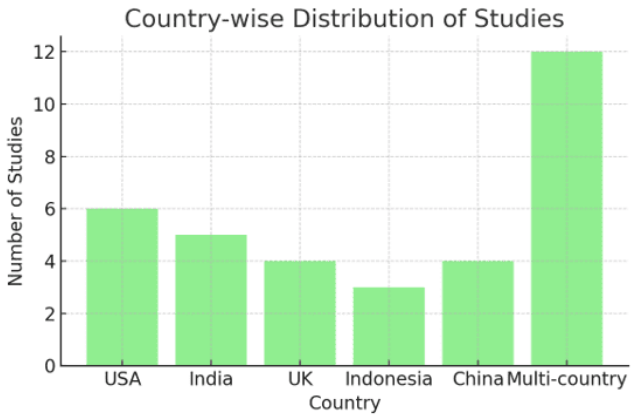

Figure 7: Geographical Distribution of Included Studies by Country. Source: Authors' own elaboration.

8.4 Comparative Interpretation and Trend Analysis

Table 10: Comparative Interpretation and Trends in GenAI and Entrepreneurship Education (2021-2025)

Aspect	Findings	Key Sources
Cross-Country and Contextual Comparison	Studies from developed economies (e.g., United States, Germany, United Kingdom) emphasize technology readiness, ethical governance, and structured integration into formal curricula. Studies from developing and emerging economies (e.g., Vietnam, India, Southeast Asia) frame GenAI more as a motivational amplifier and a partial substitute for limited infrastructural resources, providing round-the-clock instructional support in contexts characterized by large class sizes and resource constraints. Eastern academic contexts (e.g., China, South Korea, UAE) foreground regulatory considerations, teacher training requirements, and state-level digital governance frameworks. Note: these regional characterizations are based on descriptive trends in the reviewed literature and are not supported by effect-size comparisons or systematic cross-regional meta-analysis, representing a recognized limitation of the evidence base.	[1], [16], [29], [37]
Variation Across Educational Levels	Undergraduate students engage GenAI predominantly for ideation, draft writing, and business plan simulation, valuing its immediacy and practical accessibility. Postgraduate students-particularly those in MBA and innovation management programs-employ GenAI for strategic modelling, market analytics, and AI-enhanced pitch scenarios. Comparative analysis across educational levels is, however, limited in the existing literature; most studies focus on a single level, leaving the differential pedagogical effects of GenAI across learner stages as an underexplored research gap.	[2], [3], [4], [40]
Contra-dictions and Research Gaps	Three principal tensions emerge: (1) Motivation versus Dependency-while GenAI motivates learners through instant feedback and ideation support, documented risks of cognitive dependency and eroded critical independence indicate that motivational benefits are conditionally mediated by instructional design ([8]); (2) Educator Enthusiasm versus Ethical Anxiety-faculty recognize GenAI's simulation and co-creation potential but express substantive concerns about academic integrity, hallucination risks, and the absence of validated governance frameworks ([3]; Ilagan et al., 2024); (3) Usability versus Assessment Gaps-while GenAI tools are broadly regarded as user-friendly, validated frameworks for assessing entrepreneurial learning outcomes such as creativity, resilience, and strategic decision-making are almost entirely absent from the literature.	[3], [8], [18], [29]

Emerging Trends (2023-2025)	Four notable developments characterize the most recent literature: (1) AI tutors and pitch simulators-ChatGPT-4 and similar systems are increasingly employed in simulated investor pitch environments, enhancing persuasive communication and venture realism ([29]); (2) AI for critical reflection-a pedagogical trend emphasizing AI-generated reflective prompts that encourage learners to interrogate assumptions and navigate ethical dilemmas ([20]); (3) shift to co-creation models-GenAI is progressively repositioned from a content generation tool to a cognitive collaborator facilitating reasoning processes and iterative idea development (Darnell & Gopalkrishnan, 2024b); (4) educator integration tools-faculty are documented as increasingly adopting GenAI in syllabus design, case-based teaching, and adaptive learning plan development, transitioning from passive acceptance to active co-design roles (Darnell & Gopalkrishnan, 2024b; [29]).	[2], [20], [28], [29]
Synthesis and Future Directions	The trajectory of GenAI in entrepreneurship education is characterised by nonlinearity, contextual dependency, and continuing theoretical and methodological development. Key future priorities include: developing discipline-specific GenAI integration models for EE; expanding longitudinal assessments of learning and competency outcomes; ensuring intercultural usability and algorithmic fairness; strengthening educator readiness through structured training and co-design partnerships; and developing governance frameworks that address hallucination risks, algorithmic bias, and data privacy.	[4], [6]. [8], [18], [19]

9. Synthesis of Key Observations and Findings

1. GenAI as Pedagogical Enhancer: The reviewed studies collectively demonstrate that GenAI tools-including ChatGPT, Gemini, and other LLM platforms-are reshaping the delivery of entrepreneurship education by supporting interactive, personalised, and experiential learning modalities. The literature indicates a discernible shift toward more student-centred and active learning environments in contexts where GenAI is purposefully integrated [2], [3], [4].

2. Learner-Level Benefits and Cognitive Activation: Most studies report improved student engagement, creative ideation, and digital self-efficacy following GenAI integration. Tools that prompt students to explore multiple solution pathways and interrogate assumptions are associated with deeper cognitive activation. However, the quality of these gains is consistently moderated by the presence of structured educator guidance; unsupported GenAI use is associated with reduced cognitive depth [8], [9].

3. Contextual and Geographical Variability: Significant regional differences in GenAI adoption patterns and use cases are evident in the literature, reflecting variation in technology readiness, institutional infrastructure, and cultural orientations toward AI. Despite these differences, concerns about ethical governance, hallucination risks, and educator preparedness transcend regional contexts [1], [16]. These cross-country comparisons are, however, descriptive in nature; the reviewed evidence does not support systematic effect-size comparisons across regions due to the heterogeneity of study designs and outcome measures.

4. Emerging Trends and Educator Perspectives: Studies from 2023 to 2025 document increased use of GenAI for simulations, business model design, and classroom ideation activities. Student perceptions are generally positive. Educator responses are more ambivalent, characterised by simultaneous recognition of pedagogical potential and concern about plagiarism, AI dependency, and the absence of institutional support structures. Limited faculty training opportunities and unclear governance policies remain persistent barriers to sustained integration [6], [29].

5. Thematic Gaps and Emerging Research Needs: The review identifies several priority research gaps: longitudinal studies tracking the durability of GenAI's effects on entrepreneurial competency development; comparative analyses across educational levels; validated frameworks for assessing competency outcomes in AI-supported settings; empirical investigation of hallucination risks and algorithmic bias in EE contexts; and structured evaluation of data governance protocols in institutional GenAI deployment.

Table 10 maps documented benefits against corresponding risks and counter-arguments across the four thematic domains of this review.

Table 11: Contradictory Evidence — Benefits vs. Risks Across Thematic Domains

Domain	Documented Benefit	Counter-Evidence / Risk	Key Sources
Learner Engagement	Interactive GenAI loops enhance curiosity, agency, and intrinsic motivation	Without scaffolding, passive AI reliance reduces cognitive effort; novelty effects dissipate over time	[1] vs. [8], [39]
Higher-Order Thinking	Critiquing AI outputs stimulates evaluative and analytical reasoning	Passive engagement produces rhetorical mimicry without genuine cognitive development	[20] vs. [8], [9]
Stakeholder Perceptions	Students report enhanced self-efficacy; educators value simulation potential	Educators document integrity erosion, hallucination risks, and loss of pedagogical authority	[37] vs. [3], [30]
Entrepreneurial Competencies	GenAI supports opportunity recognition, ideation, and problem-solving	Hallucinated outputs may corrupt entrepreneurial decisions; competency gains are superficial without intentional design	[18] vs. [5]
Pedagogical Role	GenAI enriches experiential learning as a cognitive scaffold	AI risks displacing humanistic mentorship essential to entrepreneurial identity formation	[2] vs. [31], [27]
Ethics & Governance	AI literacy programmes can mitigate integrity risks	Algorithmic bias reproduces structural inequalities; governance frameworks lag behind AI capabilities	[9] vs. [46], [8]

10. Conclusion

This systematic literature review affirms that Generative AI holds genuine pedagogical potential for entrepreneurship education when deployed with deliberate instructional intent, critical oversight, and robust ethical governance. The evidence supports its capacity to enhance learner engagement, stimulate creative ideation, and support the development of entrepreneurial competencies including opportunity recognition, strategic reasoning, and problem-solving. However, the review equally establishes that these benefits are neither automatic nor universal; they are contingent on the quality of instructional scaffolding, the clarity of institutional frameworks, and the critical literacy of both educators and students.

A central finding of this review is that the uncritical adoption of GenAI in EE risks producing outcomes that contradict its pedagogical promise. The documented risks of cognitive offloading [8], hallucination-driven entrepreneurial decision errors [5], algorithmic bias in AI-generated content [8], and the erosion of academic integrity [9] are not peripheral concerns to be footnoted in advocacy-oriented discussions; they are substantive threats to the equitable and effective integration of GenAI that must be addressed systemically. Counter-arguments from sceptical educational perspectives-particularly regarding the displacement of authentic mentorship relationships and the risk of surface-level cognitive mimicry-deserve serious consideration in the design of any GenAI-integrated curriculum.

The review further identifies that the field lacks the theoretical and empirical infrastructure needed to evaluate GenAI's contributions with precision. Longitudinal studies, validated competency assessment frameworks, standardised governance protocols, and differentiated pedagogical models for diverse EE contexts are all priorities for the next generation of research in this domain. Without these foundations, the field risks substituting enthusiasm for evidence and advocacy for analysis.

In conclusion, GenAI's most responsible and productive role in entrepreneurship education is that of a cognitively active learning partner-not a content substitute or a competency proxy. Realising this role requires not only technological integration but institutional commitment to pedagogical design, faculty training, equitable access, and the ongoing critical evaluation of AI systems' outputs and limitations.

Appendix 1: Fifteen Most Relevant Manuscripts Used to Frame Arguments and Answer Research Questions

(Based on alignment of key findings, conclusions, aims, and methodology)

Author(s)	Year	Aim and Objective	Key Findings	Research Methodology	Conclusion
Bell & Bell	2023	To examine how GenAI is reshaping entrepreneurship education practices and pedagogical design.	GenAI functions as a pedagogical enabler by supporting ideation, venture simulation, and experiential entrepreneurial learning.	Conceptual and empirical review within entrepreneurship education context.	GenAI should be embedded as a supportive learning partner rather than a replacement for human mentorship.
Winkler et al.	2023	To explore the transformation of entrepreneurship education in the era of GenAI.	AI-driven tools enhance student engagement, creative ideation, and interactive venture-based learning experiences.	Exploratory academic analysis and literature-based synthesis.	GenAI can modernise entrepreneurship pedagogy by making learning more experiential and innovation-oriented.
Somia & Vecchiarini	2024	To investigate the impact of artificial intelligence on students' entrepreneurial competencies.	AI-assisted tasks improve feasibility of business ideas, innovative thinking, and opportunity recognition skills.	Empirical research with competency-focused analytical framework.	AI technologies can significantly strengthen entrepreneurial skill development within structured learning environments.
Dwivedi et al.	2023	To analyse the broader opportunities, risks, and implications of GenAI across education and practice.	GenAI offers productivity gains and personalised learning support but raises ethical and cognitive dependency concerns.	Multidisciplinary opinion-based scholarly analysis.	Responsible and ethical integration is essential to maximise educational benefits while minimising integrity risks.
Chen & Ifenthaler	2024	To map the role of AI within entrepreneurship education through a structured review.	The review identifies scarcity of pedagogical frameworks and limited empirical integration of AI in EE curricula.	Scoping review methodology.	There is an urgent need for structured instructional models to effectively embed AI in entrepreneurship education.
Namoun et al.	2024	To synthesise applications and challenges of GenAI in educational contexts.	GenAI enhances personalised learning, feedback mechanisms, and academic task support.	Umbrella review of existing educational AI studies.	GenAI requires institutional policies and ethical governance for sustainable adoption.
George-Reyes et al.	2024	To develop scientific entrepreneurship and complex thinking through AI-assisted narrative learning.	ChatGPT-supported tasks significantly enhance creativity, synthesis ability, and complex thinking skills.	Experimental educational intervention study.	AI-assisted learning environments can cultivate higher-order thinking and entrepreneurial creativity simultaneously.
Sudirman & Rahmatillah	2023	To examine the effectiveness of AI-assisted discovery learning for entrepreneurship students.	Improved exploration of original business ideas and deeper conceptual engagement among students using AI tools.	Experimental educational design with AI-assisted learning model.	Discovery-based learning supported by AI strengthens student autonomy and entrepreneurial exploration.
Mueller-Saegebrecht & Lippert	2024	To evaluate the use of ChatGPT-4 in teaching business model innovation.	AI-supported instruction enhances real-time prototyping and strategic business model development.	Applied pedagogical case study.	GenAI can enrich entrepreneurship teaching by enabling authentic and practice-driven learning experiences.
Cotton et al.	2023	To explore academic integrity challenges in the era of ChatGPT & AI-assisted learning.	Increased concerns regarding plagiarism, authorship ambiguity, and over-reliance on AI-generated outputs.	Conceptual and policy-focused academic analysis.	Educational institutions must redesign assessment and integrity frameworks in response to GenAI usage.
Noroozi et al.	2024	To analyse pedagogical, theoretical, and methodological perspectives of GenAI.	GenAI supports collaborative learning, reflective thinking, and adaptive pedagogy.	Theoretical and methodological synthesis.	AI integration should be pedagogically guided to ensure meaningful cognitive engagement.
Lim et al.	2023	To examine the paradoxical impact of GenAI on the future of education.	GenAI simultaneously acts as a transformative educational tool and a disruptive force in traditional teaching roles.	Conceptual scholarly perspective.	The future of education will involve co-existence of AI augmentation and human-centred pedagogy.
Kusetogullari et al.	2025	To systematically review the role of GenAI in entrepreneurship research and practice.	Emerging trends in AI-driven venture ideation, decision-making, and entrepreneurial innovation are identified.	Systematic literature review.	GenAI is becoming a foundational tool influencing both entrepreneurial learning and real-world entrepreneurial ecosystems.

Thanasi-Boce & Hoxha	2024	To investigate the role of LLMs and conversational agents in building entrepreneurship knowledge.	Prompt engineering and AI dialogue systems enhance venture ideation and knowledge construction processes.	Empirical educational technology research.	Conversational AI can act as an intellectual scaffold in entrepreneurship learning when used critically.
Baidoo-Anu & Ansah	2023	To understand the benefits of ChatGPT in promoting teaching and learning in higher education.	Improved learner engagement, faster content generation, and enhanced academic assistance through AI tools.	Analytical and conceptual educational study.	ChatGPT has strong instructional value but must be used with ethical awareness and academic guidance.

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