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AI-Augmented Entrepreneurship Pedagogy Action Model (AI-EPAM): A Transformative Framework for Entrepreneurial Skill Development and Venture Success

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Abstract

Entrepreneurship education in many emerging and digitally transforming economies continues to exhibit a persistent paradox of high entrepreneurial intention alongside weak venture sustainability. This study addresses this execution gap by proposing the AI-Augmented Entrepreneurship Pedagogy Action Model (AI-EPAM), a systemic pedagogical framework designed to support execution-oriented capability development. Using a design-based research approach, the study integrates three complementary empirical components, which include a curriculum analysis of 58 entrepreneurship-related courses across nine Thai universities, a macro-level analysis of entrepreneurial ecosystem patterns using Global Entrepreneurship Monitor data, and expert-based conceptual validation through a two-round Delphi study. The curriculum analysis reveals a dominant emphasis on theory-oriented and planning-focused instruction, with limited integration of experiential, data-informed, and AI-enabled learning. The ecosystem analysis identifies structural patterns in which high entrepreneurial participation coexists with weak innovation capability, limited digital readiness, and elevated fear of failure during venture execution. Expert validation underscores the importance of educator mediation, institutional readiness, and ethical governance in AI-augmented entrepreneurship education. Synthesizing these findings, AI-EPAM conceptualizes artificial intelligence not as a stand-alone instructional tool but as a mediated pedagogical co-agent within a triadic learning ecosystem comprising learners, educators, and AI systems. While the study does not empirically evaluate learning or venture outcomes, it offers a theoretically grounded and empirically informed framework that addresses execution-oriented learning gaps and provides a foundation for future research on AI-augmented pedagogy.

Keywords: Artificial Intelligence in Education, AI-Augmented Entrepreneurship Pedagogy Action Model (AI-EPAM), AI-Augmented Pedagogy, Entrepreneurship Education, AI Literacy, Entrepreneurial Competencies

1. Introduction

Entrepreneurship education has expanded rapidly over the past two decades and is now widely embedded within higher education systems across both developed and emerging economies, driven by policy aspirations to stimulate innovation, employment creation, and economic resilience. Despite this expansion, a persistent paradox remains evident, particularly in emerging and digitally transforming contexts. While entrepreneurial intention and participation rates are often high, venture sustainability and execution outcomes remain comparatively weak. This divergence raises critical questions about whether prevailing entrepreneurship education designs adequately prepare learners for entrepreneurial execution in increasingly complex, data-intensive, and technologically mediated environments.

Much of the entrepreneurship education literature has focused on cultivating entrepreneurial mindset, intention formation, and opportunity recognition. Although these efforts have enhanced understanding of how entrepreneurial aspirations develop, intention alone does not ensure sustained venture performance. Entrepreneurs now operate under conditions of rapid technological change, algorithmic mediation, and heightened uncertainty, where execution-oriented capabilities such as adaptive decision-making, data interpretation, and ethical judgment are central. When educational designs emphasize conceptual knowledge and static planning, learners may be insufficiently equipped to navigate these execution challenges. Recent advances in artificial intelligence have intensified interest in its potential to enhance entrepreneurship education. Existing studies have examined AI-enabled tutoring, adaptive learning systems, and analytics-driven feedback. However, much of this work treats AI as an instrumental add-on rather than as an integrated component of pedagogical systems. Consequently, the interaction among learners, educators, and AI systems remains under-theorized, and ethical considerations are often framed as compliance issues rather than as developmental learning objectives. This limits the capacity of AI-enabled approaches to address execution-oriented capability gaps.

At the macro level, entrepreneurial ecosystem evidence similarly indicates that high entrepreneurial entry often coexists with weak innovation capability, limited digital readiness, and elevated fear of failure during venture execution. These patterns suggest that the core challenge lies not in motivation or opportunity perception, but in the development of capabilities required to sustain and scale entrepreneurial activity. Together, these observations point to the need for pedagogical frameworks that move beyond intention formation and explicitly support execution-oriented learning in digitally intensive contexts. This study addresses this gap by proposing the AI-Augmented Entrepreneurship Pedagogy Action Model (AI-EPAM), a systemic pedagogical framework designed to support execution-oriented capability development through the responsible and mediated integration of artificial intelligence. Rather than positioning AI as a stand-alone tutor or instructional substitute, AI-EPAM conceptualizes AI as a pedagogical co-agent embedded within a triadic learning ecosystem comprising learners, educators, and AI systems. The model emphasizes educator mediation, collaborative intelligence, ethical reasoning development, and human-in-the-loop oversight as central design principles.

The study contributes to entrepreneurship education scholarship in three ways. First, it reframes the entrepreneurship education challenge by shifting analytical attention from intention formation to execution-oriented capability development. Second, it advances the literature by proposing a theoretically integrated and empirically informed pedagogical architecture that embeds AI within learning processes rather than treating it as a discrete technological intervention. Third, it responds to emerging ethical and institutional concerns by explicitly incorporating feasibility conditions and ethical reasoning development within the pedagogical design. Methodologically, the study adopts a design-based research approach that integrates curriculum analysis, macro-level entrepreneurial ecosystem evidence, and expert-based conceptual validation. While the study does not empirically evaluate learning or venture outcomes, it offers a conceptually validated framework that provides a foundation for subsequent empirical testing and contextual adaptation.

1.1. Research Objectives

To address the structural misalignment between current entrepreneurship education practices and the competencies required in AI-mediated entrepreneurial environments, this study pursues the following objectives. First, it seeks to identify pedagogical gaps within Thai entrepreneurship curricula, particularly those associated with digital fluency, analytical capability, and AI-enabled learning processes. Second, it examines national ecosystem indicators, including longitudinal GEM datasets, to determine how macro-level capability execution gaps reinforce the need for pedagogical transformation. Third, it aims to develop and conceptually validate the AI-EPAM model using a design-based research approach integrating curriculum analysis, ecosystem evidence, and expert consensus. A further objective is to specify the pedagogical, technological, and ethical conditions required for implementing AI-responsive entrepreneurship education in higher education institutions. Finally, the study articulates the theoretical and practical contributions of AI-EPAM as a systemic, triadic model for cultivating entrepreneurial competencies in digitally dynamic environments.

1.2. Research Questions

Guided by these objectives, the study addresses the following research questions:

1. What pedagogical gaps exist within Thai entrepreneurship curricula, particularly in their integration of digital competencies, analytical skills, and AI-enabled learning practices?
2. How do national-level entrepreneurial ecosystem indicators, particularly GEM data, reflect a capability execution gap that current educational approaches fail to address?
3. What pedagogical, technological, and ethical requirements must be satisfied for AI-augmented entrepreneurship education to be feasible, effective, and ethically governed?
4. How can AI be conceptualized as a pedagogical co-agent rather than a technological add-on, and what structural features should such a model incorporate?
5. In what ways does the proposed AI-EPAM model provide a theoretically coherent and contextually appropriate response to the curricular and ecosystem deficits identified?
6. How does the integration of curriculum analysis, ecosystem indicators, and expert consensus support the design and conceptual validation of an AI-augmented pedagogical framework for entrepreneurship education?

Together, these objectives and questions establish a coherent analytical foundation for examining how AI-enabled pedagogical systems can address entrenched capability gaps and enhance the alignment between educational provision and the demands of contemporary entrepreneurial ecosystems. They also clarify the study's contribution to advancing scholarship in entrepreneurship education, AI-mediated learning, and design-based educational innovation.

2. Literature Review

This literature review synthesizes four domains essential to the development of the AI-Augmented Entrepreneurship Pedagogy Action Model (AI-EPAM), i.e., (1) foundations of entrepreneurship education, (2) theoretical frameworks guiding AI integration in pedagogy, (3) existing AI-augmented learning models, and (4) policy and practice gaps in the Thai higher education ecosystem. Together, these domains demonstrate the conceptual and contextual need for a pedagogical model that integrates AI as an active agent in entrepreneurial learning.

2.1. Pedagogical Foundations of Entrepreneurship Education

Entrepreneurship education has evolved from a narrow emphasis on knowledge transmission to a broader developmental framework focused on mindset, behavior, and experiential competence. Foundational typologies, including "education about," "education for," "education through," and "education in" entrepreneurship, highlight a progression from conceptual understanding toward action-oriented learning embedded in authentic practice (Fayolle & Gailly, 2008; Gibb, 2002; Jamieson, 1984). Contemporary scholarship asserts that effective entrepreneurship education must cultivate opportunity recognition, resilience, uncertainty navigation, and iterative problem-solving (Neck & Greene, 2011; Rae, 2006). However, empirical studies of Thai entrepreneurship curricula show a continued dominance of theoretical instruction and business-planning-centered outcomes, with limited scaffolding of digital competencies or adaptive behavioral skills.

This imbalance is increasingly problematic given the rapid digitalization of entrepreneurial ecosystems worldwide. Recent research demonstrates that generative AI substantially expands entrepreneurial agency by reducing information asymmetries, lowering cognitive burdens, and enabling individuals and small ventures to identify opportunities and make more sophisticated decisions than their resource base would otherwise allow (Li et al., 2025). Complementary reviews further show that AI technologies are reshaping the entrepreneurial process by creating new opportunity structures and altering how entrepreneurs enact, evaluate, and refine business ideas (Uriarte, L., et al., 2025; Uriarte, S., et al., 2025). Empirical evidence also confirms that AI enhances decision-making, innovation capability, and venture performance, reinforcing its role as a catalyst for entrepreneurial success (Al-Mamary, 2025). Collectively, these developments underscore the need to redesign entrepreneurship pedagogy to better align with AI-mediated entrepreneurial practice.

2.2. Theoretical Underpinnings for AI Integration in Pedagogy

AI adoption in educational settings is grounded in several theoretical frameworks that explain how technology enhances learning and how institutions adapt to innovation. From a pedagogical perspective, constructivism and Self-Determination Theory (SDT) posit that learners benefit from adaptive feedback, autonomy support, and competence-enhancing learning environments (Deci & Ryan, 2000). AI systems can operationalize these principles through real-time analytics, adaptive content, and personalized feedback cycles. From an organizational perspective, the Technology-Organization-Environment (TOE) framework (Tornatzky & Fleischer, 1990) and Diffusion of Innovation theory (Rogers, 2003) explain variation in institutional readiness, technology acceptance, and implementation dynamics. These theories highlight that successful AI integration requires not only technical capability but also educator preparedness, organizational culture, and environmental support. Higher education research further indicates that while AI has significant potential to increase instructional efficiency, formative assessment quality, and learner engagement, its adoption remains constrained by limited faculty literacy and ethical concerns (Holmes et al., 2019; Zawacki-Richter et al., 2019). Collectively, these frameworks justify the need for structured pedagogical models that align technological affordances with human-centered learning design.

2.3. Existing AI-Augmented Pedagogical Models

Recent advances in AI-enhanced education have produced several models tailored to specific learning objectives. Frameworks such as CRAFT improve research skills through AI-supported literature review processes (Dangprasert, 2025), while ESANN uses deep-learning architectures to build entrepreneurial competencies among educators (Li, 2025). Models such as GAISEE demonstrate AI’s capacity to strengthen students’ entrepreneurial self-efficacy via generative-AI-supported learning environments (Xie & Wang, 2025). Additionally, AI-integrated business simulation environments demonstrate positive effects on entrepreneurial decision-making and reflective learning (Aliyev et al., 2025). While these models show promising outcomes, most operate at the level of task augmentation rather than systemic pedagogical transformation. They do not conceptualize AI as a co-actor within the instructional process nor provide guidance on ethical governance or educator-AI-student interaction. The trajectory of these models suggests an emerging need for integrated, ecosystemic pedagogical frameworks capable of embedding AI into learning design rather than into isolated tasks.

2.4. Comparative Overview of Key AI-Augmented Pedagogical Models

Existing AI-augmented pedagogical frameworks provide important precursors but remain fragmented, task-specific, or limited in system-level integration. Table 1 synthesizes four prominent models to clarify their pedagogical functions and theoretical orientations. The comparison reveals that most existing models focus on discrete cognitive tasks (e.g., literature review, simulation-based decision-making) rather than systemic transformation of learning ecosystems. This gap underscores the need for a holistic, triadic model such as AI-EPAM, which integrates AI, learner behaviors, and educator roles within a unified instructional architecture.

Table 1: Comparative Overview of Key AI-Augmented Pedagogical Models

Model / Framework	Primary Purpose	Key Pedagogical Function	Target Users	Relevance to AI-EPAM
CRAFT (Dangprasert, 2025)	Enhance literature review proficiency	AI-supported synthesis, citation verification	Undergraduate / postgraduate students	Demonstrates task-specific augmentation; informs AI-EPAM's cognitive scaffolding mechanisms
ESANN (Li , 2025)	Develop entrepreneurial competencies	Deep-learning–driven skills assessment and personalized development	Educators	Provides insights on AI-enabled competency mapping, supporting AI-EPAM's adaptive pathways
GAISEE (Xie & Wang, 2025)	Strengthen entrepreneurial self-efficacy	Generative AI feedback, ideation enhancement	Students in entrepreneurship courses	Relevant for AI-EPAM's motivational and SDT-aligned autonomy support
AI-Enabled Business Simulation Games (BSGs) (Aliyev et al., 2025)	Improve strategic decision-making	Risk-free, AI-enhanced simulation environments	Students / trainees	Supports experiential learning pillar within AI-EPAM

Note. This table synthesizes representative AI-augmented pedagogical models to identify design principles informing the development of AI-EPAM.
Source: Author's Own Creation, 2025

The insights from Table 1 therefore directly inform the conceptual development of AI-EPAM by identifying missing structural components needed for an AI-integrated entrepreneurship pedagogy. While existing AI-augmented pedagogical frameworks demonstrate the potential of artificial intelligence to enhance discrete learning tasks, they do not offer an integrated theoretical explanation of how AI, educators, and learners interact within a unified entrepreneurship education system. To address this gap, the following subsection synthesizes the theoretical foundations that jointly inform the design logic of the AI-Augmented Entrepreneurship Pedagogy Action Model.

2.5. Integrated Theoretical Foundations Guiding the AI-EPAM Model

The development of the AI-Augmented Entrepreneurship Pedagogy Action Model (AI-EPAM) is grounded in an integrated set of theoretical perspectives that explain how entrepreneurial capabilities are formed, how learning is mediated through technology, and how institutional conditions shape pedagogical feasibility. Rather than treating artificial intelligence as a neutral instructional tool, this study conceptualizes AI as a pedagogical co-agent whose effectiveness depends on alignment across experiential learning, learner motivation, and organizational readiness. This positioning is jointly informed by entrepreneurial learning theory, Self-Determination Theory, and the Technology-Organization-Environment framework. Entrepreneurial learning theory conceptualizes entrepreneurship as an iterative process of capability development rather than linear knowledge acquisition. Entrepreneurial competence emerges through cycles of action, reflection, experimentation, and feedback embedded in practice-based contexts (Rae, 2006; Neck & Greene, 2011).

When entrepreneurship education relies heavily on lecture-based instruction and static planning exercises, it fails to reproduce these conditions and limits learners' ability to translate intention into sustained venture execution. AI-EPAM draws on this logic by embedding iterative learning cycles and experimentation within its pedagogical architecture. Self-Determination Theory explains how such learning environments sustain engagement and competence development by supporting autonomy, competence, and relatedness (Deci & Ryan, 2000). In AI-augmented contexts, these needs can be operationalized through adaptive feedback, personalized learning pathways, and opportunities for reflective decision-making. Within AI-EPAM, AI is positioned as an adaptive learning partner rather than a prescriptive instructor, while educators assume roles centered on autonomy support, ethical mediation, and reflective facilitation, thereby preserving human agency. While these theories explain individual-level learning and motivation, they do not account for institutional feasibility. The Technology-Organization-Environment framework addresses this limitation by explaining how AI adoption depends on organizational readiness and environmental constraints (Tornatzky & Fleischer, 1990).

In higher education, meaningful AI integration requires educator capability, governance structures, and policy alignment, with empirical research identifying limited institutional readiness and faculty literacy as key barriers (Zawacki-Richter et al., 2019; Holmes et al., 2019). Accordingly, AI-EPAM incorporates institutional readiness, educator upskilling, and ethical governance as core design conditions. Together, these perspectives provide a coherent theoretical basis for positioning AI within a triadic learning ecosystem comprising learners, educators, and AI systems. Entrepreneurial learning theory explains the nature of capability development, Self-Determination Theory explains motivational sustainability, and the Technology-Organization-Environment framework explains implementation feasibility. Their integration justifies AI-EPAM as a systemic pedagogical architecture that embeds AI within iterative learning processes, redefines educator roles for ethical and pedagogical mediation, and treats organizational readiness as integral rather than peripheral to effective AI-augmented entrepreneurship education.

2.6. Policy, Practice, and Pedagogical Gaps in Thailand

Thailand's innovation and higher education policies such as Thailand 4.0, the National AI Strategy (2022-2027), and Ministry of Higher Education Science Research and Innovation (MHESI) directives prioritize digital transformation, AI literacy, and ethical AI use. Yet institutional adoption remains fragmented. Studies show that student use of AI tools such as generative models far outpaces educator literacy, curricular integration, and assessment reform (Holmes et al., 2022; UNESCO, 2021). This creates misalignment between learner behavior, institutional structures, and labor market expectations. Comparative analyses of Thai entrepreneurship curricula reveal limited incorporation of AI, data analytics, or digital innovation skills, despite national workforce needs. Meanwhile, macro-level entrepreneurial indicators reveal persistent weaknesses in innovation capability, digital readiness, and venture survival (GEM Global Report, 2025; GEM Thailand, 2025).

These gaps collectively indicate the need for a pedagogical model that:
(1) systemically embeds AI into learning processes,
(2) enhances entrepreneurial competencies aligned with digital-era demands, and
(3) provides ethical and instructional guardrails for responsible AI use.

Across these domains, the literature converges on a single implication. Entrepreneurship education must transition from content delivery to adaptive, AI-informed learning ecosystems that support higher-order skills, ethical reasoning, and venture resilience. Existing models provide valuable components but do not offer a cohesive pedagogical architecture that integrates learners, educators, and AI tools within transparent, iterative learning cycles. AI-EPAM addresses this gap by providing a theoretically grounded, contextually relevant pedagogical model that responds directly to Thailand's structural entrepreneurial challenges and emerging technological landscape.

3. AI-Augmented Entrepreneurship Pedagogy Action Model (AI-EPAM)

The AI-Augmented Entrepreneurship Pedagogy Action Model (AI-EPAM) is proposed as a systemic pedagogical architecture designed to address persistent capability execution gaps in entrepreneurship education. Rather than conceptualizing artificial intelligence as a supplementary instructional tool, the model positions AI as a pedagogical co-agent operating within a triadic learning ecosystem comprising the entrepreneurial learner, the augmented educator, and the AI system. This triadic structure enables continuous interaction, feedback, and adaptation, which are necessary conditions for entrepreneurial capability development in digitally mediated environments. The model is grounded in the integrated theoretical foundations established earlier and is empirically informed by curriculum analysis, entrepreneurial ecosystem indicators, and expert consensus. AI-EPAM therefore represents a synthesis of theory, evidence, and feasibility considerations rather than a purely conceptual abstraction. Figure 1 presents the AI-Augmented Entrepreneurship Pedagogy Action Model (AI-EPAM), illustrating the triadic learning ecosystem that connects the entrepreneurial learner, the augmented educator, and the AI system through continuous interaction, feedback, and ethical oversight.

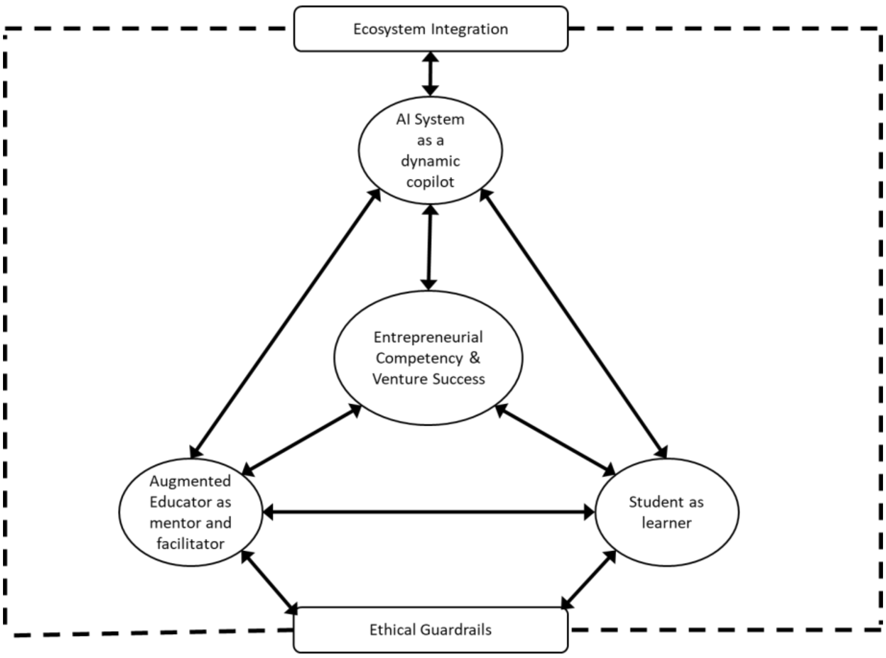

Figure 1: Conceptual AI-Augmented Entrepreneurship Pedagogy Action Model (AI-EPAM)
Source: Author's Own Creation, 2025.

3.1. Core Design Logic of the AI-EPAM Model

At the center of the model lies entrepreneurial competency development and venture execution capability, which represent the intended pedagogical outcomes. These outcomes are not assumed to emerge from content exposure alone, but from iterative learning processes that involve experimentation, reflection, feedback, and ethical judgment. AI-EPAM operationalizes these processes through structured interactions among its three primary actors.

First, the entrepreneurial learner engages in opportunity recognition, problem framing, data interpretation, and decision-making activities supported by AI-generated analytics, simulations, and feedback. These interactions are designed to reduce cognitive barriers while preserving learner agency. AI does not replace entrepreneurial judgment, but augments learners' ability to test assumptions, explore alternatives, and reflect on consequences. Second, the educator functions as an augmented pedagogical mediator rather than a traditional content transmitter. The educator's role includes scaffolding learning tasks, interpreting AI-generated outputs, guiding reflective sensemaking, and ensuring that AI use aligns with learning objectives and ethical standards. This role is critical for maintaining autonomy support and preventing overreliance on algorithmic outputs, consistent with research on human-centered AI in education (Holmes et al., 2019; UNESCO, 2021). Third, the AI system operates as a dynamic learning copilot that supports personalization, pattern recognition, and scenario exploration. Its function is adaptive rather than prescriptive. The system provides data-driven feedback, generates alternative pathways, and supports iterative experimentation, but final evaluative authority remains with the learner and educator. This human-in-the-loop configuration is a deliberate design choice to preserve accountability, transparency, and pedagogical integrity.

3.2. Collaborative Intelligence and Peer Interaction

Responding directly to concerns that entrepreneurship is inherently social and cannot be reduced to individual AI interaction, AI-EPAM explicitly incorporates collaborative intelligence as a structural feature of the learning ecosystem. Collaborative intelligence refers to the capacity of learners to engage in shared problem-solving, peer validation, and collective sensemaking, mediated but not replaced by AI systems. Within AI-EPAM, AI functions as an intermediary that facilitates collaboration by aggregating peer inputs, simulating market feedback, and supporting group-based reflection. Learners are encouraged to test ideas not only through AI-generated scenarios but also through structured peer interaction, critique, and co-creation. This design reflects empirical evidence that entrepreneurial learning is strengthened when individual experimentation is embedded within social validation processes (Rae, 2006). By positioning AI as a connector among learners rather than a one-to-one tutor, the model addresses reviewer concerns about realism and ensures alignment with authentic entrepreneurial practice, where opportunity evaluation and venture development occur within networks rather than in isolation.

3.3. Ethical Reasoning Development as a Pedagogical Competency

Ethics within AI-EPAM is framed not as a set of external compliance rules but as a developmental competency embedded within entrepreneurial learning. Ethical reasoning development refers to learners' capacity to recognize ethical dilemmas, evaluate trade-offs, and justify decisions in contexts involving uncertainty, data asymmetry, and algorithmic influence. AI-EPAM operationalizes ethical reasoning through scenario-based learning, where AI systems generate ethically ambiguous situations related to data use, automation, bias, and stakeholder impact. Learners are required to articulate decision rationales, reflect on consequences, and engage in guided discussion facilitated by educators. In this configuration, AI functions as a sparring partner that surfaces ethical tensions rather than as an authority that resolves them. Human oversight is maintained throughout the process. Educators retain responsibility for assessment, interpretation, and ethical judgment, while AI outputs are treated as inputs for deliberation rather than determinations. This approach aligns with international frameworks for responsible and human-centered AI in education and responds directly to concerns regarding transparency, bias, and learner agency (Holmes et al., 2022; UNESCO, 2021).

3.4. Institutional Readiness and Feasibility Conditions

AI-EPAM explicitly acknowledges that pedagogical effectiveness depends on institutional readiness. The model therefore incorporates infrastructural capacity, educator upskilling, and governance mechanisms as enabling conditions rather than implementation afterthoughts. This inclusion reflects insights from the Technology-Organization-Environment framework and expert validation findings, which indicate that AI adoption without organizational preparedness leads to superficial or inequitable outcomes. By embedding these conditions within the model architecture, AI-EPAM avoids the assumption that pedagogical innovation can occur independently of institutional constraints. Instead, it offers a realistic and adaptable framework that can be scaled across institutions with varying levels of digital maturity.

3.5. Model Boundary Conditions

AI-EPAM is designed as a pedagogical framework rather than a prescriptive instructional script. It does not assume uniform technological access, educator expertise, or institutional capacity. Its application requires contextual adaptation, particularly in environments with limited digital infrastructure or restrictive governance conditions. These boundary conditions are explicitly acknowledged to prevent overgeneralization and to maintain conceptual integrity.

4. Methodology

4.1. Research Design and Methodological Rationale

This study adopts a design-based research (DBR) methodology to develop and conceptually validate the AI-Augmented Entrepreneurship Pedagogy Action Model (AI-EPAM). DBR is appropriate for this study because the research objective is not limited to describing existing phenomena, but rather to designing, justifying, and refining a pedagogical framework grounded in both theory and empirical evidence. Unlike purely experimental or survey-based approaches, DBR allows for the systematic integration of problem analysis, theoretical synthesis, iterative model development, and stakeholder validation within authentic educational contexts (Wang & Hannafin, 2005; McKenney & Reeves, 2018). The choice of DBR directly addresses the central aim of this study, which is to propose a pedagogical model that responds to a persistent capability execution gap in entrepreneurship education rather than to test learner outcomes at this stage. In this respect, the study is positioned at the conceptual validation phase of DBR, where the emphasis lies on theoretical coherence, empirical grounding, and feasibility assessment, rather than on large-scale implementation or impact measurement. This methodological positioning is made explicit to avoid overclaiming empirical effectiveness, in line with established DBR guidance (Reeves, 2006). Consistent with DBR principles, the research design integrates three complementary empirical components, i.e., curriculum analysis, macro-level entrepreneurial ecosystem analysis, and expert-based conceptual validation through the Delphi method. Each component serves a distinct analytical function and collectively strengthens the internal logic and credibility of the proposed model through triangulation.

4.2. Curriculum Analysis

The first empirical component involved a systematic curriculum analysis of entrepreneurship education in Thailand to identify prevailing pedagogical orientations and gaps relevant to AI integration. A purposive sampling strategy was employed to select nine Thai universities offering formal entrepreneurship programs. The sample was designed to reflect institutional diversity, including public universities, private universities, and international campuses, thereby enhancing the representativeness of pedagogical practices examined. A total of 58 entrepreneurship-related course syllabi were collected from publicly accessible curriculum repositories and faculty-provided materials.

Syllabi were selected as units of analysis because they formally articulate intended learning outcomes, pedagogical approaches, assessment strategies, and content emphasis, which together provide a reliable proxy for curricular design at the program level. While syllabi do not capture all enacted classroom practices, they remain a widely accepted data source for curriculum-level analysis in higher education research. Thematic analysis was conducted following the systematic procedures outlined by Braun and Clarke (2006), including data familiarization, initial coding, theme development, and refinement. Five analytical codes were developed inductively and iteratively to capture dominant pedagogical emphases, which are entrepreneurial mindset, entrepreneurial practice, resource integration, growth management, and innovation and technology. Two trained coders independently analyzed all syllabi using a shared codebook. Interrater reliability was assessed using Cohen's kappa, yielding a coefficient of 0.84, which indicates substantial agreement and supports the reliability of the coding process.

To operationalize the thematic analysis of the entrepreneurship syllabi, an analytical coding framework was developed through an iterative process of data familiarization, initial open coding, and refinement informed by established entrepreneurship education typologies. The resulting five analytical codes capture dominant pedagogical orientations reflected in course design, learning activities, and assessment emphases. These codes function as classification categories rather than evaluative outcomes and were used to systematically identify patterns and gaps in curricular emphasis relevant to AI integration. The analytical codes and their associated pedagogical focuses, which guided the syllabus analysis and informed subsequent model design, are summarized in Table 2.

Table 2: Summary of Syllabus Thematic Mapping (n = 58 Courses)

Code	Pedagogical Focus	Example Learning Activities	AI-Integration Readiness	Typical Course Type
EM – Entrepreneurial Mindset	Ideation, creativity, effectuation	Opportunity mapping, reflective journals	Low	Introduction to Entrepreneurship
EP – Entrepreneurial Practice	Venture creation, prototyping	Lean startup projects, MVP development	Moderate	New Venture Development
RI – Resource Integration	Network building, resource mobilization	Crowdfunding, stakeholder mapping	Moderate	Entrepreneurial Finance
GM – Growth Management	Scaling, strategy, digital transformation	Scenario planning, growth simulations	High	Strategic Entrepreneurship
IT – Innovation & Technology	AI applications, analytics	Data analytics workshops, AI tools lab	Very High	Technology-Driven Startups

Note. Codes were derived through thematic analysis; intercoder reliability = κ .84.
Source: Author's Own Creation, 2025

The curriculum analysis served two purposes within the DBR logic. First, it empirically identified structural pedagogical gaps, particularly the limited integration of AI, data analytics, and adaptive learning mechanisms. Second, it informed the design requirements of AI-EPAM by clarifying which competencies and learning processes were underrepresented in existing curricula.

4.3. Macro-Level Entrepreneurial Ecosystem Analysis Using GEM Data

To situate curricular findings within a broader entrepreneurial context, the study conducted a comparative analysis of Global Entrepreneurship Monitor (GEM) datasets from 2019 and 2024/2025. The purpose of this analysis was not to perform statistical trend testing, but to identify persistent ecosystem-level patterns that contextualize educational capability gaps. Key indicators examined included total early-stage entrepreneurial activity, established business survival, innovation capability, fear of failure, and digital readiness. Given changes in GEM reporting structures and indicator definitions across years, direct year-to-year statistical comparison was not feasible. This limitation was addressed by adopting a pattern-based analytical approach recommended by the GEM Global Consortium, focusing on directional consistency rather than precise numerical equivalence (GEM, 2025). Indicators were reviewed for structural persistence and convergence, particularly where multiple measures pointed to similar capability constraints. This component strengthens the methodological rigor of the study by linking micro-level pedagogical gaps to macro-level entrepreneurial outcomes. The GEM analysis provides ecosystem-level justification for why AI-enabled competencies, analytical reasoning, and adaptive decision-making are critical learning objectives for entrepreneurship education. By explicitly acknowledging comparability constraints while defending the robustness of observed patterns, this analysis addresses possible concerns of methodological transparency and overinterpretation.

4.4. Delphi Expert Validation

The third empirical component employed the Delphi method to conceptually validate the AI-EPAM model and assess its pedagogical coherence, feasibility, and ethical adequacy. The Delphi method was selected due to its suitability for structured expert consensus-building in contexts where empirical implementation data are not yet available (Hsu & Sandford, 2007). Its use is consistent with DBR, which emphasizes iterative refinement through stakeholder engagement. Eight experts participated in the Delphi study, comprising four academics with expertise in entrepreneurship education, educational innovation, or technology-enhanced learning, and four industry practitioners with direct experience in startup development, AI-enabled business environments, or digital innovation. A purposive sampling strategy was employed to ensure balanced representation of pedagogical and industry perspectives. In Delphi research, panels of this size are considered appropriate for exploratory conceptual validation when participants are highly specialized and information-rich (Hsu & Sandford, 2007).

The Delphi process consisted of two rounds. In the first round, experts reviewed the draft AI-EPAM model and provided qualitative feedback on its conceptual clarity, educator role definition, infrastructural requirements, and ethical safeguards. Responses were thematically coded to identify areas of convergence and concern. Based on this synthesis, the model was revised to strengthen ethical governance, clarify educator responsibilities, and refine the role of AI as a pedagogical co-agent. In the second round, the revised model and synthesized feedback were returned to participants for confirmation and further commentary. Reduced variance in qualitative responses and convergence across pedagogical, technological, and ethical dimensions indicated satisfactory stability of expert consensus. This iterative process enhanced the internal coherence and practical plausibility of the model without claiming empirical effectiveness.

4.5. Methodological Rigor and Trustworthiness

Methodological rigor was ensured through triangulation across data sources, analytical procedures, and stakeholder perspectives. Curriculum analysis provided micro-level pedagogical evidence, GEM indicators supplied macro-level ecosystem context, and Delphi validation incorporated expert judgment to assess feasibility and ethical soundness. This triangulation mitigates the limitations inherent in any single method and strengthens the credibility of the model development process. Trustworthiness in qualitative analysis was addressed through transparent coding procedures, interrater reliability assessment, and iterative refinement of analytical categories. The DBR framework further enhances ecological validity by grounding model development in authentic institutional and ecosystem contexts rather than abstract theorization alone (Reeves, 2006). Importantly, this study does not claim to evaluate learning outcomes or venture performance. Instead, it positions AI-EPAM as a conceptually validated pedagogical framework that is theoretically grounded, empirically informed, and contextually feasible. This methodological boundary is explicitly stated to align claims with evidence and to establish a clear foundation for subsequent empirical testing.

5. Results

The results are organized in accordance with the design-based research structure and address three analytical strands, which include curriculum analysis, macro-level entrepreneurial ecosystem patterns, and Delphi expert validation. Rather than merely reporting distributions or summaries, this section interprets the findings in relation to entrepreneurial learning theory, Self-Determination Theory, and the institutional readiness conditions articulated in the Technology-Organization-Environment framework. Together, these results explain why existing entrepreneurship education structures struggle to convert entrepreneurial intention into sustainable venture outcomes and how these deficiencies inform the design logic of AI-EPAM.

5.1. Curriculum Analysis Results

Analysis of 58 entrepreneurship syllabi across nine Thai universities reveals a strong structural emphasis on theory-oriented and lecture-based instruction. As summarized in Table 3, 72 percent of courses prioritize conceptual instruction or business planning activities, while only 18 percent emphasize experiential or project-based learning, and 10 percent explicitly integrate digital or AI-related components.

Table 3: Pedagogical Distribution and AI Integration in 58 Entrepreneurship Syllabi

Category	Description	Percentage of Courses
Lecture-based / Theory-dominant	Traditional instruction; minimal student autonomy	72%
Experiential / Project-based	Simulations, real-world projects, prototyping	18%
Digital or AI-Integrated	Explicit AI tools, analytics, or digital innovation components	10%

Note. Results indicate a strong bias toward theory-centric instruction, with AI integration remaining peripheral.
Source: Author's Own Creation, 2025

This distribution indicates that entrepreneurship education in Thailand remains predominantly aligned with education about entrepreneurship rather than learning through or in entrepreneurship, as defined in established pedagogical typologies (Fayolle & Gailly, 2008; Gibb, 2002). From an entrepreneurial learning perspective, this imbalance constrains learners' exposure to iterative experimentation, uncertainty navigation, and feedback-driven adaptation, which are essential mechanisms for entrepreneurial capability development (Rae, 2006). The limited integration of AI and digital analytics further reinforces this constraint. Courses categorized under innovation and technology were few and concentrated primarily in advanced or elective offerings. This pattern suggests that digital and analytical competencies are treated as specialized skills rather than foundational entrepreneurial capabilities. As a result, learners are insufficiently scaffolded to engage with data-intensive opportunity recognition, AI-supported decision-making, or technology-mediated market validation processes.

While Table 3 summarizes the distribution of pedagogical approaches across entrepreneurship curricula, distributional data alone does not explain how these approaches align with established entrepreneurship education typologies or the learning processes required for entrepreneurial capability development. To deepen interpretation beyond frequency counts, the identified thematic emphases were mapped onto internationally recognized entrepreneurship education typologies. This mapping clarifies the structural pedagogical orientation of existing curricula and reveals the extent to which learning designs emphasize conceptual understanding, experiential engagement, or embedded entrepreneurial practice. The resulting synthesis is presented in Table 4.

Table 4: Thematic Synthesis and Interpretation of Syllabus Findings

Thematic Code	Pedagogical Orientation	Corresponding Entrepreneurship Typology	Interpretive Meaning
EM – Entrepreneurial Mindset	Ideation, creativity, effectuation	Education about entrepreneurship	Strengthens conceptual and attitudinal foundations
EP – Entrepreneurial Practice	Venture creation, prototyping	Education for entrepreneurship	Builds behavioral and skill-based competencies
RI – Resource Integration	Network/resource mobilization	Education through entrepreneurship	Facilitates ecosystem participation and applied learning
GM – Growth Management	Scaling, strategy, digital transformation	Education through / in entrepreneurship	Develops strategic and reflective capabilities
IT – Innovation & Technology	AI, analytics, digital innovation	Education in / embedded entrepreneurship	Enables cross-disciplinary digital competency development

Note. Codes aligned with international entrepreneurship education typologies (Jamieson, 1984; Gibb, 2002; Fayolle & Gailly, 2008).
Source: Author's Own Creation, 2025

Table 4 extends this interpretation by mapping the thematic codes onto entrepreneurship education typologies. The mapping reveals a systematic underrepresentation of pedagogical approaches associated with learning through and learning in entrepreneurship. These approaches are most strongly associated with venture resilience and adaptive capability formation in digitally dynamic environments (Neck & Greene, 2011). The results therefore indicate not only a curricular content gap, but also a structural pedagogical misalignment between instructional design and the learning processes required for entrepreneurial execution.

5.2. Macro-Level Entrepreneurial Ecosystem Patterns from GEM Data

The analysis of Global Entrepreneurship Monitor (GEM) indicators from 2019 and 2024/2025 reveals a persistent divergence between entrepreneurial participation and venture sustainability in Thailand. While total early-stage entrepreneurial activity remains comparatively high, the proportion of established businesses has declined over the same period. This pattern indicates that entrepreneurial intention and opportunity perception continue to outpace the capacity for sustained venture execution. Several structural features of the ecosystem emerge consistently across the GEM indicators examined. First, measures related to innovation capability and digital readiness remain weak relative to participation rates. Although entrepreneurs increasingly perceive opportunities, their ability to translate these opportunities into scalable and durable ventures appears constrained by limited analytical capability, low adoption of advanced digital tools, and insufficient integration of data-driven decision-making processes.

This imbalance suggests that the primary challenge lies not in ideation or motivation, but in execution under conditions of technological and market complexity. Second, fear of failure has increased despite stable or improving opportunity perception. This combination indicates heightened uncertainty during the venture development and scaling phases rather than at entry. From an entrepreneurial learning perspective, this pattern is consistent with environments where individuals lack sufficient experiential exposure to iterative experimentation, risk management, and adaptive decision-making. When entrepreneurs are inadequately prepared to interpret market signals, evaluate trade-offs, or leverage digital tools, uncertainty shifts from being a source of learning to a barrier to persistence. Third, indicators related to entrepreneurial capacity and specialized human capital remain low. These indicators reflect limitations in skills associated with innovation management, digital analytics, and technology-enabled coordination. Importantly, these competencies align closely with those that are underrepresented in the curriculum analysis, particularly AI literacy, analytical reasoning, and reflective use of digital tools. The convergence between curriculum-level deficiencies and ecosystem-level constraints strengthens the interpretation that educational structures contribute to the observed capability execution gap.

It is necessary to acknowledge limitations in the comparability of GEM indicators across reporting periods. Changes in survey instruments and indicator definitions restrict the feasibility of direct year-to-year statistical comparison. However, the analytical purpose of this study is not to establish precise longitudinal causality, but to identify persistent directional patterns that remain robust across measurement changes. The consistency of the observed relationships among participation rates, survival outcomes, innovation capability, and digital readiness across reporting cycles supports the validity of a pattern-based interpretation, as recommended by the GEM Global Consortium (GEM, 2025). Within the design-based research logic of this study, the GEM analysis serves as macro-level contextual validation rather than outcome evaluation. The results indicate that entrepreneurial ecosystems characterized by high entry rates but weak survival outcomes are likely to require educational interventions that strengthen execution-oriented competencies rather than motivational inputs alone. This finding directly informs the pedagogical rationale of AI-EPAM by demonstrating why adaptive learning mechanisms, data-informed decision support, and iterative feedback processes are necessary components of contemporary entrepreneurship education.

5.3. Delphi Expert Validation Results

The Delphi study yielded strong convergence across two iterative rounds regarding the feasibility and conceptual coherence of AI-EPAM. Expert responses consistently emphasized three enabling conditions for effective AI-augmented entrepreneurship education, which are educator capability, scalable digital infrastructure, and ethical governance.

First, experts identified educator competence as the most critical determinant of feasibility. Without sufficient pedagogical literacy in AI-mediated instruction, AI tools risk being used superficially or instrumentally, thereby reinforcing existing instructional limitations rather than transforming learning processes. This finding aligns with prior research indicating that educator readiness is a primary constraint on meaningful AI integration in higher education (Zawacki-Richter et al., 2019).

Second, experts emphasized the need for interoperable and low-barrier digital infrastructure. AI-augmented pedagogy requires platforms capable of supporting adaptive feedback, collaborative learning, and reflective analytics across institutions with varying resource levels. This condition directly reflects the organizational and technological dimensions of the Technology-Organization-Environment framework and reinforces the importance of institutional readiness.

Third, ethical governance emerged as a non-negotiable requirement. Experts expressed concern regarding algorithmic opacity, bias, and learner overreliance on AI-generated outputs. They emphasized that ethical safeguards must be embedded within instructional design rather than appended as policy statements. The convergence of expert views on this point validates the positioning of ethical reasoning development and human oversight as core components of AI-EPAM. The reduction in variance between Delphi rounds indicates increasing consensus on these conditions, suggesting that the model's design logic is both coherent and practically plausible within current higher education environments.

5.4. Synthesis of Results Across Analytical Strands

Taken together, the results reveal a coherent explanatory pattern. At the curriculum level, entrepreneurship education remains structurally misaligned with the learning processes required for AI-mediated entrepreneurial execution. At the ecosystem level, this misalignment manifests as a persistent gap between entrepreneurial intention and venture survival. At the expert level, there is strong agreement that AI can address this gap only when integrated within a pedagogically sound, ethically governed, and institutionally supported framework. This synthesis explains why incremental curricular adjustments are insufficient. The results demonstrate that effective entrepreneurship education in digitally intensive environments requires a systemic pedagogical architecture capable of embedding AI into learning processes, facilitating collaborative intelligence, and supporting ethical decision-making. These findings collectively justify the design and positioning of AI-EPAM as a response to both micro-level pedagogical deficiencies and macro-level ecosystem constraints.

Importantly, these findings do not imply that ecosystem constraints are uniform across regions or institutions. Digital infrastructure, policy environments, and institutional readiness vary substantially within Thailand and across ASEAN economies. The GEM results therefore justify the need for a flexible pedagogical framework that can adapt to heterogeneous conditions rather than a prescriptive model assuming uniform readiness. In this respect, the macro-level analysis reinforces the relevance of embedding institutional feasibility and ethical governance within the pedagogical design, rather than treating them as external implementation concerns.

6. Discussion

This study sets out to address a persistent paradox in entrepreneurship education contexts characterized by high entrepreneurial intention but low venture survival. By integrating curriculum-level analysis, macro-level entrepreneurial ecosystem indicators, and expert-based conceptual validation, the findings collectively demonstrate that this paradox is not primarily motivational in nature. Instead, it reflects a structural misalignment between prevailing pedagogical designs and the execution-oriented capabilities required in digitally intensive entrepreneurial environments. The discussion interprets these findings in relation to existing theory, clarifies the contribution of AI-EPAM, and delineates the implications for entrepreneurship education practice and research.

6.1. Reframing the Entrepreneurship Education Problem

Existing entrepreneurship education literature has long emphasized intention formation, opportunity recognition, and entrepreneurial mindset development as central pedagogical goals. While these dimensions remain important, the results of this study suggest that they are insufficient to explain venture sustainability outcomes in contemporary contexts. The convergence between curriculum analysis and GEM indicators indicates that learners are frequently exposed to conceptual knowledge about entrepreneurship, but are less systematically prepared for iterative execution, adaptive decision-making, and technology-mediated problem solving.

From an entrepreneurial learning perspective, this finding reinforces the argument that learning about entrepreneurship does not translate automatically into learning through or learning in entrepreneurship. Capability development requires repeated engagement with uncertainty, feedback, and consequence-bearing decisions. When pedagogical designs privilege static planning and theoretical abstraction, learners are inadequately prepared to navigate dynamic market conditions, particularly those shaped by rapid technological change. This reframing shifts the educational problem from one of insufficient motivation to one of insufficient execution-oriented learning design.

6.2. Theoretical Implications for Entrepreneurial Learning and Motivation

The findings extend entrepreneurial learning theory by highlighting the limitations of experiential learning when it is not supported by adaptive and data-informed feedback mechanisms. While experiential approaches are widely advocated, their effectiveness depends on the quality of reflection, feedback, and sensemaking processes embedded within learning activities. In digitally mediated environments, these processes increasingly require analytical support and simulation capabilities that exceed what traditional classroom interactions alone can provide. Self-Determination Theory offers further explanatory power by clarifying why execution challenges persist even among highly motivated individuals. When learners lack perceived competence in navigating complex, data-rich environments, autonomy may translate into uncertainty rather than empowerment. The results suggest that AI-augmented pedagogical designs can support competence development by enabling learners to test assumptions, explore alternatives, and reflect on outcomes without prematurely escalating risk. Importantly, this support must be structured in a way that preserves learner agency and avoids substituting algorithmic outputs for human judgment.

6.3. Contribution of AI-EPAM to Pedagogical Design

AI-EPAM contributes to entrepreneurship education scholarship by advancing a systemic pedagogical architecture rather than a tool-centric intervention. Unlike prior models that emphasize discrete applications of artificial intelligence, AI-EPAM integrates AI within a triadic learning ecosystem that connects learners, educators, and technology through continuous interaction and oversight. This configuration addresses a critical gap in the literature, which has often treated AI either as an efficiency-enhancing instrument or as a stand-alone tutor, rather than as a mediated component of a broader learning system. The explicit incorporation of collaborative intelligence responds to empirical and theoretical insights that entrepreneurship is inherently social and networked. By positioning AI as an intermediary that facilitates peer validation and collective sensemaking, the model aligns pedagogical design with authentic entrepreneurial practice. This approach avoids the risk of individualizing entrepreneurship learning in ways that detach learners from social feedback and market realities.

Equally important is the reframing of ethics as a developmental competency. Rather than treating ethical considerations as compliance constraints, AI-EPAM embeds ethical reasoning within decision-making practice. This design choice reflects growing consensus in AI and education scholarship that ethical competence must be cultivated through active engagement with ambiguity, trade-offs, and responsibility. The discussion therefore positions AI-EPAM as a response not only to pedagogical inefficiency, but also to ethical challenges associated with AI-mediated learning environments.

6.4. Institutional and Contextual Implications

The discussion also underscores the importance of institutional readiness as a determinant of pedagogical effectiveness. The GEM analysis and expert validation jointly indicate that educational innovation cannot be decoupled from infrastructural capacity, educator capability, and governance mechanisms. AI-EPAM's explicit acknowledgment of these conditions differentiates it from aspirational frameworks that assume uniform readiness across institutions and regions. In the context of Thailand and broader ASEAN economies, this finding has particular relevance. Variability in digital infrastructure, faculty training, and policy environments necessitates flexible pedagogical frameworks that can be adapted rather than replicated wholesale. The discussion therefore positions AI-EPAM as a guiding architecture that supports contextual adaptation, rather than a prescriptive model that assumes standardized implementation conditions.

7. Limitations of Research

This study's contributions should be interpreted in light of several limitations. First, the curriculum analysis relied on publicly accessible syllabi and faculty-provided materials, which may not fully reflect actual classroom practices, unrecorded digital activities, or informal learning processes. Although thematic coding was conducted rigorously, the analysis remains interpretive and may not capture pedagogical variations across institutions. Second, the GEM comparative analysis was constrained by shifts in reporting metrics across years, limiting the precision of longitudinal comparisons. The patterns identified therefore offer directional insights rather than statistically granular trends. Third, while the Delphi panel size was appropriate for exploratory consensus-building, it does not represent the full heterogeneity of entrepreneurship educators and industry practitioners in Thailand. As such, the expert validation strengthens conceptual coherence but does not constitute empirical testing of AI-EPAM. Finally, as a design-based research study, AI-EPAM remains at the conceptual validation stage. Its effectiveness, scalability, and learner impact require systematic empirical investigation across diverse educational and technological environments. These limitations highlight fertile pathways for future research and do not detract from the model's theoretical and practical contributions.

8. Future Research Directions

While this study provides a conceptually validated pedagogical framework, it does not evaluate learning outcomes or venture performance empirically. This boundary condition is intentional and reflects the design-based research positioning of the study. Future research should empirically test the effectiveness of AI-EPAM through longitudinal and comparative designs that examine learner capability development, decision quality, and venture outcomes across diverse institutional contexts. Further research is also needed to explore how ethical reasoning development unfolds over time in AI-augmented learning environments and how educators negotiate their mediating role as AI systems become more sophisticated. Comparative studies across ASEAN contexts would additionally contribute to understanding how institutional and cultural factors shape the transferability of AI-augmented pedagogical frameworks.

9. Conclusion

This study proposed the AI-Augmented Entrepreneurship Pedagogy Action Model (AI-EPAM) to address a persistent execution gap in entrepreneurship education contexts characterized by high entrepreneurial intention but weak venture sustainability. Drawing on curriculum analysis, macro-level entrepreneurial ecosystem indicators, and expert-based conceptual validation within a design-based research framework, the findings indicate that this gap stems less from motivational deficits than from structural misalignment between prevailing pedagogical designs and the capabilities required for entrepreneurial execution in digitally intensive environments. The results show that entrepreneurship curricula continue to privilege conceptual instruction and static planning activities while underrepresenting experiential, data-informed, and technology-mediated learning processes. At the ecosystem level, these pedagogical limitations correspond with persistent patterns of weak innovation capability, limited digital readiness, and elevated fear of failure during venture execution. Together, these findings provide convergent evidence that traditional entrepreneurship education approaches are insufficient for preparing learners to operate under conditions of uncertainty, complexity, and rapid technological change. AI-EPAM contributes to entrepreneurship education scholarship by advancing a systemic pedagogical architecture that integrates artificial intelligence as a mediated co-agent within a triadic learning ecosystem comprising learners, educators, and AI systems.

Rather than treating AI as a stand-alone instructional tool, the model embeds AI within iterative learning processes supported by educator mediation, peer interaction, and ethical oversight, enabling collaborative intelligence, adaptive feedback, and reflective decision-making while preserving human agency and accountability. The study also reframes ethics as a developmental competency embedded within entrepreneurial learning rather than as a compliance-oriented constraint. By integrating ethical reasoning into scenario-based learning and decision practice, AI-EPAM aligns pedagogical innovation with principles of responsible and human-centered artificial intelligence. This study does not empirically evaluate learning or venture outcomes. AI-EPAM is presented as a conceptually validated, theoretically grounded, and empirically informed framework whose application depends on institutional readiness, educator capability, and governance conditions that vary across contexts. Future research should empirically examine the model's effectiveness through longitudinal and comparative designs and explore how ethical reasoning and educator mediation evolve within AI-augmented learning environments. Overall, the study advances entrepreneurship education research by shifting emphasis from intention formation toward execution-oriented capability development and by demonstrating how artificial intelligence can be responsibly embedded within pedagogical systems rather than applied as isolated tools.

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