Developing Entrepreneurial Mindset Among Non-Business Majors Through Experiential Learning and AI Tools

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Abstract: Despite the proliferation of entrepreneurship education (EE) programs, conventional pedagogies often fall short in cultivating the critical cognitive and affective dimensions of the entrepreneurial mindset, particularly in areas such as opportunity recognition, creative problem-solving, and resilience. This study addresses this enduring pedagogical challenge by embedding experiential learning and generative artificial intelligence (AI) tools into an entrepreneurship education. Drawing upon Kolb's Experiential Learning Theory and Biggs' Constructive Alignment frameworks, the instructional design integrated immersive fieldwork, problem-based tasks, and iterative AI-supported learning experiences. Generative AI tools were strategically deployed to scaffold ideation, support inquiry, and enhance formative feedback throughout the entrepreneurial process. Using a mixed-methods approach, the study assessed the entrepreneurial mindset (EM) of 92 postgraduate students before and after the intervention. Partial Least Squares Structural Equation Modeling (PLS-SEM) confirmed EE explains 47.8% of the variance in EM. Quantitative findings reveal a statistically significant 35.48% increase in EM scores. Qualitative data, drawn from student reflections and thematic analyses, further underscored the perceived value of AI integration and real-world engagement in fostering entrepreneurial thinking, industry relevance, and innovation capacity. The findings contribute to the evolving discourse on entrepreneurship education by demonstrating the pedagogical value of integrating immersive, AI-augmented experiential learning in developing future-ready entrepreneurial competencies. By incorporating AI into the experiential learning framework, students were not only trained in research methods and entrepreneurial problem-solving but also in AI literacy, which is increasingly seen as an essential futuristic skill. This study makes a theoretical contribution by empirically validating how Kolb's Experiential Learning Theory and Biggs' Constructive Alignment Model can be enhanced through AI integration in entrepreneurship education. It offers actionable insights for educators and institutions seeking to modernize entrepreneurship programs. Our problem-based approach, incorporating immersive field trips, AI-assisted research tools (ChatGPT, DeepSeek), and authentic assessments, proved particularly effective in developing students' critical thinking, opportunity recognition, and adaptive problem-solving skills.

Keywords: Entrepreneurship education, Experiential learning, Entrepreneurial mindset, Artificial intelligence, Constructive alignment

1. Introduction

Traditional theoretical approaches often fail to cultivate essential entrepreneurial competencies such as opportunity recognition, resilience, and creative problem-solving. This is especially evident in educational settings where practical entrepreneurial experience is limited, and students primarily rely on passive learning methods. To address this gap, educators are increasingly adopting immersive, problem-based learning strategies, enhanced by generative artificial intelligence (AI) tools, to foster entrepreneurial mindsets (EM) and real-world readiness (Mugge et al, 2021). The concept of EM refers to a set of cognitive and affective orientations that enable individuals to identify opportunities, navigate uncertainty, and persist in the face of challenges (Mathisen & Arnulf, 2013; Cui et al., 2019). It typically encompasses dimensions such as opportunity recognition, creative problem-solving, resilience, initiative, and risk tolerance (Larsen et al., 2023; Kusumojanto et al., 2021).

This research presents an action-based, pedagogically driven intervention that integrates immersive field trips, problem-based learning, and AI-assisted cognitive tools into a postgraduate course on entrepreneurship and innovation Students were not only immersed in industry contexts, but also equipped with AI-driven tools to assist in ideation, research, writing, and feedback loops throughout the problem-solving process.

The pedagogical design aligns with the UK Professional Standards Framework (UKPSF), on the design of learning activities and teaching effectiveness. A constructive alignment model guided the development of outcomes, experiential activities, and assessments to ensure cohesive and authentic learning. The inclusion of AI tools enhances this approach by enabling students to generate insights, critique content (Huang et al, 2023) and simulate business scenarios, reinforcing iterative learning processes and digital literacy competencies critical to modern practices (Aoun, 2017). Drawing from both student feedback and peer observation, it became clear that there was a need to test whether a combination of immersive, AI-supported experiential learning can significantly impact students' entrepreneurial mindset. Specifically, the study asks:

- Do immersive field trips and AI-integrated learning impact students' perceptions of industry-relevant entrepreneurship education?
- Does entrepreneurship education, enhanced with AI and experiential methods, influence students' entrepreneurial mindsets?

By responding to these questions, this study contributes to the evolving discourse on entrepreneurship education by exploring how real-world engagement and digital augmentation can jointly foster deeper learning, critical reflection, and innovation capabilities among aspiring entrepreneurs. It also responds to recent scholarly calls for greater integration of technological tools in business education and for pedagogies that reflect the complexities of contemporary entrepreneurial ecosystems (Mugge et al, 2021; Selwyn, 2019).

2. Theoretical Background and Hypotheses Development

Entrepreneurship education flourishes when theoretical knowledge is purposefully integrated with active, student-centered learning. Kolb's (1984) experiential learning theory remains central to this approach, advocating a cyclical process of concrete experience, reflective observation, abstract conceptualization, and active experimentation. In this study, students engaged in immersive activities such as analyzing smart city developments and solving real business challenges, which served as the concrete experiences fueling deeper learning. These experiences were paired with reflective discussions, classroom-based conceptual modeling, and iterative assessments, thereby enhancing critical entrepreneurial competencies such as opportunity recognition, creative problem-solving, and resilience (Neck and Greene, 2011; Pittaway and Cope, 2007). Underpinned by Biggs' (1996) Constructive Alignment framework, the curriculum was deliberately structured so that learning outcomes, teaching activities, and assessments worked in synergy. Assessments, ranging from peer-reviewed group work and reflective essays to AI-assisted reports, evaluated students' capacity to bridge theory with actionable insight (Dobson et al, 2021).

A key innovation of this pedagogical model was the integration of generative AI tools, including ChatGPT, DeepSeek, and AI-supported analytics platforms, as digital collaborators in the learning process. Rather than replacing critical thinking, these tools augmented students' cognitive capacities by supporting ideation, business simulation, customer profiling, and rapid prototyping in real time (Mugge et al, 2021). This use of AI aligned with Kolb's (1984) "active experimentation" phase, offering students instant feedback and a low-stakes environment for iterative exploration. Beyond content generation, AI also functioned as a metacognitive scaffold, assisting students in identifying gaps, structuring arguments, and refining inquiry-based outputs (Luckin et al, 2016). Importantly, AI usage followed a human-in-the-loop model where instructors facilitated ethical engagement, critical evaluation, and collaborative refinement (Selwyn, 2019). This approach not only supported reflective practice and collaborative inquiry but also cultivated essential digital competencies for future entrepreneurial contexts (Aoun, 2017). Nevertheless, as Teräs et al (2020) caution, the pedagogical use of AI must be deliberate to prevent superficial learning, reinforcing its role as a supplement to, not a substitute for, authentic educational design.

Experiential learning is particularly powerful when embedded in real-world contexts, offering students meaningful exposure to the complexities of entrepreneurial practice (Fuchs et al, 2008). Dewey (1963) emphasized the value of connecting theory and experience, and modern scholars argue for nuanced strategies to bridge traditional and progressive education (Huang et al, 2023). In China, initiatives like the 'Mass Entrepreneurship and Innovation' policy have expanded the role of entrepreneurship education in higher education (Huang et al, 2023), aimed at fostering innovation and addressing youth unemployment (Wright et al, 2021). While the conceptual roots of entrepreneurship education are often Western, its localization within China's cultural and economic landscape is critical (Bell, 2020; Lyu et al, 2021). Immersive field trips not only expose students to authentic industry contexts but also enhance networking, inspire entrepreneurial identity, and promote the practical application of learned concepts (Larsen, 2022). These opportunities, grounded in experiential and progressive education, support the development of entrepreneurial competencies through real-time engagement with market and technological dynamics.

Moreover, entrepreneurship education fosters the skills, knowledge, and personal attributes required for entrepreneurial action (Cui et al, 2019). It cultivates creativity, risk-taking, initiative, and ambition, key elements of the entrepreneurial mindset, which has been consistently linked to entrepreneurial intention (Kusumojanto et al, 2021). Through confidence-building and practical engagement, such education fosters a mindset of innovation and action. In this study, students were tasked with evaluating real business challenges and developing viable solutions, exemplifying how problem-based learning can nurture opportunity-driven thinking

(Sorensen and Kuada, 2022). Entrepreneurship education influences both cognitive and affective domains, shaping how students think and feel about entrepreneurial challenges (Larsen et al, 2023). Evidence from fields like engineering also demonstrates how problem-based approaches enhance creativity and foster innovative responses to complex problems (Holgaard et al, 2022), supporting the case for embedding such models more deeply in entrepreneurship curricula.

Hypothesis: Entrepreneurship education enriched with experiential learning and AI tools enhances students' entrepreneurial mindset (EM).

3. Methodology

This study adopted an action research approach within a full-credit postgraduate entrepreneurship course, aiming to examine how experiential learning and AI-enhanced instruction influence the development of students' entrepreneurial mindset (EM). The research followed a two-phase, partially mixed methods design (Creswell & Plano-Clark, 2018), incorporating both quantitative and qualitative data to enable a comprehensive evaluation of the intervention.

3.1 Research Design

The study employed a quasi-experimental, one-group pre-test/post-test design without a control group, appropriate for educational settings where random assignment or withholding pedagogical interventions is not feasible. While this limits causal inference, the design still enables the examination of changes over time attributable to the intervention.

Phase 1 involved the pre-intervention administration of validated survey instruments to establish a baseline measure of students' entrepreneurial mindset and perceptions of entrepreneurship education. Phase 2 was the post-intervention phase, in which both quantitative and qualitative data were collected concurrently to assess the outcomes of the learning intervention and gain deeper insight into students' experiences. This design enabled triangulation and helped mitigate some internal validity limitations inherent in the absence of a control group.

3.2 Participants and Procedure

A total of 98 postgraduate students enrolled in the course, of which 92 provided matched responses for both pre- and post-intervention surveys. Participation was voluntary and ethically approved by the university's review board.

The intervention was structured around problem-based and experiential learning activities, including two immersive field visits: (1) a trip to Suzhou's historic water towns to study digital transformation in SMEs, and (2) a visit to a niche e-bike manufacturer navigating domestic market challenges. Students conducted interviews, market research, and developed strategic solutions based on these engagements. These activities were aligned with Kolb's (1984) Experiential Learning Theory and Biggs' (1996) Constructive Alignment model and constructivist pedagogy (Fayolle and Gailly, 2008; Neck and Greene, 2011), while assessments reflected authentic learning practices.

3.3 Quantitative Data Collection and Analysis

Students' entrepreneurial mindset and perceptions of entrepreneurship education were measured using validated instruments of Entrepreneurship Education (EE) adopted from Wardana et al. (2020) and Entrepreneurial Mindset (EM) from Mathisen and Arnulf (2013). Both instruments used a 7-point Likert scale. Data were analyzed using Partial Least Squares Structural Equation Modeling (PLS-SEM) to assess the relationships between constructs and the statistical impact of the intervention.

3.4 Integration of Generative AI Tools

The course design integrated generative AI tools (ChatGPT, DeepSeek, Grammarly, Co-Pilot, and AI-enhanced visualization platforms) to scaffold learning. These tools were framed as cognitive supports, enhancing ideation, research, writing, and feedback processes while maintaining a human-in-the-loop model. Students were encouraged to critically evaluate AI-generated content using scholarly and real-world data (Luckin et al., 2016; Selwyn, 2019). This AI-enhanced learning environment was designed to promote metacognition, digital literacy, and critical thinking, in line with Kolb's "active experimentation" stage and Aoun's (2017) future-oriented learning framework.

3.5 Qualitative Strand

To complement and contextualize the quantitative results, the post-intervention survey included three open-ended questions focusing on students' reflections on entrepreneurial mindset development, experiential learning, and AI tool use. Responses were analyzed using thematic coding in NVivo, and a word cloud was generated to visualize key terms and recurring themes. This qualitative data was integrated at the interpretation stage, providing deeper insights into the experiential and cognitive outcomes of the intervention.

4. Results

4.1 Comparison of Mean Scores Before and After the Intervention

The data in Table 1 provides strong support for Hypothesis 1, indicating that entrepreneurship education significantly enhances students' entrepreneurial mindset. The overall mean score for entrepreneurial mindset increased from 3.875 to 5.25 (35.48% improvement). All individual items (EM1 to EM4) showed significant improvements.

4.2 PLS-SEM Results

SmartPLS 4.0 software application was used to analyse data and test the hypothesized relationships in two stages of measurement model and structural model assessment as suggested by Hair et al (2022). The reliability and validity of the constructs are presented in Table 5. Composite reliability (rho_a) values were above the recommended threshold of 0.70, specifically, EE had 0.82, and EM had 0.84, confirming the reliability of the constructs. The average variance extracted (AVE) values were above the 0.50 indicating convergent validity.

Table 1: Entrepreneurial Mindset Mean scores

Items	Mean Score at start	Mean Score at End	Difference	% Change
EM1	3.85	5.2	1.35	35.06%
EM2	3.75	5.5	1.75	46.67%
EM3	3.9	5.25	1.35	34.62%
EM4	4.0	5.05	1.05	26.25%
Overall	3.875	5.25	1.375	35.48%

Discriminant validity was assessed using the Fornell-Larcker criterion, as shown in Table 6. The square root of the AVE (diagonal elements) for each construct was higher than the correlations with other constructs (off-diagonal elements), demonstrating adequate discriminant validity (Hair et al, 2022). The structural model was evaluated by examining the path coefficients, standard deviations, T statistics, P values, and confidence intervals, as shown in Table 2. The path from EE to EM had a coefficient of 0.635 ($T = 8.94$, $p < 0.001$). The r-square values indicate that EE explained 47.80% variance in EM of the students.

Table 2: Structural Model Results

	Path Coefficient	Standard deviation	T statistics	P value	Lower Level Confidence Interval (2.5%)	Upper Level Confidence Interval (97.5%)
EE -> EM	0.635	0.071	8.94	<0.001	0.041	0.902

5. Discussion

Our findings indicate that pedagogically-driven immersive field trips and problem-based tasks indeed have a significant impact on students' perceptions of the effectiveness of entrepreneurship education. This suggests that by immersing students in real-world contexts, these field trips facilitate deeper learning experiences and foster a sense of entrepreneurial identity, as posited by Fayolle and Gailly (2008) and Neck and Greene (2011). Furthermore, results indicate that entrepreneurship education positively influences students' entrepreneurial mindset. This aligns with the progressive education principles and constructivist theory, emphasizing active engagement and practical acumen, which are essential for integrating theory with practice (Felder and Brent, 2009; Kolb, 1984). Through collaborative inquiry and experiential activities, students engage with real-world challenges and develop entrepreneurial competencies in a supportive learning environment (Gibb, 2009) which fosters a culture of continuous improvement and professional development (Biggs, 1996).

The word cloud (Figure 1) visually represents keywords extracted from students' open-ended responses, highlighting their reflections on learning outcomes and course design. Prominent five-letter action words such as "learn," "build," "think," and "solve" reinforce the course's emphasis on active learning and problem-solving. The presence of terms like "A.I," "mindset," and "ideas" underscores the influence of digital tools and cognitive development on students' entrepreneurial thinking. Words such as "teams," "plans," and "start" reflect students' collaborative and solution-focused engagement with real-world tasks. The recurring appearance of these terms suggests that the experiential and immersive teaching strategies successfully translated into lasting conceptual and practical understanding.

Figure 1: Student responses to open-ended questions

This study makes a theoretical contribution by empirically validating how Kolb's Experiential Learning Theory and Biggs' Constructive Alignment Model can be enhanced through AI integration in entrepreneurship education. While prior research (Larsen et al, 2023; Selwyn, 2019) has highlighted the limitations of traditional, theory-heavy EE approaches in developing lasting entrepreneurial competencies, our findings demonstrate that immersive, AI-augmented learning experiences create more sustainable mindset shifts by bridging the critical gap between abstract knowledge and practical application. The research extends current understanding by showing how generative AI tools serve as cognitive scaffolds that amplify Kolb's learning cycle - particularly in the reflection and active experimentation phases - while maintaining human oversight for ethical engagement (Selwyn, 2019). Furthermore, we address contextual debates in EE literature (Sorensen and Kuada, 2022) by providing evidence that properly scaffolded experiential learning, when combined with AI-enabled iteration and feedback loops, can overcome the cultural and implementation barriers that often limit the transferability of entrepreneurial skills across educational settings.

The study offers actionable insights for educators and institutions seeking to modernize entrepreneurship programs. Our problem-based approach - incorporating immersive field trips, AI-assisted research tools (ChatGPT, DeepSeek), and authentic assessments - proved particularly effective in developing students' critical thinking, opportunity recognition, and adaptive problem-solving skills. Three key practical takeaways emerge: First, the interdisciplinary nature of our cohort (students from 10 disciplines) demonstrated how cross-pollination of knowledge domains enhances entrepreneurial solution-building, suggesting curricula should break down traditional subject silos. Second, the AI-human collaboration model provided a blueprint for maintaining academic rigor while leveraging technology's benefits - students used AI for ideation and prototyping but were required to validate outputs through primary research and stakeholder interviews. Third, the partnership with local businesses created a sustainable ecosystem for work-integrated learning, addressing common resource constraints by making field experiences mutually beneficial for students and industry partners. These findings provide a replicable framework for institutions aiming to develop future-ready entrepreneurial competencies through blended digital-physical learning environments.

6. Limitations

This study has several limitations that should be acknowledged. First, the use of a one-group pre-test/post-test design without a control group limits causal inference. Improvements in entrepreneurial mindset scores cannot be definitively attributed to the intervention, as external factors may have influenced the outcomes. Second, while the study employed a concurrent mixed-methods approach, the quantitative phase dominated, and the rationale for integration could be more fully developed. Third, the absence of randomization and reliance on self-reported data may introduce bias and affect internal validity. Lastly, as the study was conducted within a single institution and program, findings may not be generalizable. Future research should consider more rigorous experimental designs, include control groups, and diversify data sources and participant profiles to enhance validity and applicability.

Ethics Declarations: Ethical clearance was obtained from university ethics review committee.

AI declaration: The authors confirm that they themselves are creators of this work and AI tool (ChatGPT) was merely used for language refinement, sentence structure, and grammatical improvements.

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