

AI and Creativity in Entrepreneurship Education: A Systematic Review of LLM Applications

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Abstract: The rapid advancement of artificial intelligence (AI) and digital transformation is reshaping labor markets, emphasizing creativity as a core competency in entrepreneurship education. Large Language Models (LLMs) provide personalized learning experiences through natural language processing (NLP), enhancing real-time feedback and problem-solving skills. However, research on how LLMs foster creativity in entrepreneurship education remains limited. This study analyzed the technical characteristics and educational impact of LLMs, focusing on their applications in entrepreneurship education and their role in fostering creativity-driven learning environments. Specifically, it explores the educational effects of LLMs, their integration into entrepreneurship education, and the ways in which they enhance learners' creative thinking. A systematic literature review using the PRISMA methodology was conducted to analyze existing studies. Findings suggest that LLMs improve self-efficacy, cognitive engagement, and creative problem-solving, supporting entrepreneurship education in areas such as business model development, market analysis, and multicultural communication. Despite these benefits, concerns remain regarding over-reliance, ethical risks, and the need for critical thinking frameworks. This study proposes a hybrid model integrating LLMs with traditional pedagogies to maximize creativity. Future research should explore long-term effects, cross-cultural applications, and ethical challenges to ensure responsible implementation.

Keywords: artificial intelligence; large language models; creativity; entrepreneurship education; digital learning



Academic Editor: Hyeon Jo

Received: 19 March 2025

Revised: 29 April 2025

Accepted: 2 May 2025

Published: 14 May 2025

Citation: Park, J.-H.; Kim, S.-J.; Lee, S.-T. AI and Creativity in Entrepreneurship Education: A Systematic Review of LLM Applications. *AI* **2025**, *6*, 100. <https://doi.org/10.3390/ai6050100>

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1. Introduction

The rapid advancement of digital transformation and artificial intelligence (AI) technologies is fundamentally reshaping job environments and shifting skill demands on a global scale. This transformation not only enhances the efficiency of traditional tasks but also underscores the critical importance of acquiring essential skills and cultivating creative problem-solving abilities in evolving occupational settings. Digitalization is transforming the labor market by automating existing jobs while simultaneously generating new technology-driven professions. Moreover, the proliferation of platform-based economies and non-traditional employment structures is reshaping conventional labor practices, necessitating policy interventions to enhance worker protections and expand skills training initiatives [1].

In this context, non-cognitive competencies—particularly creativity, resilience, flexibility, and self-motivation—are increasingly recognized as indispensable for future workforces. The Future of Jobs Report 2025 by the World Economic Forum identifies creative thinking, agility, self-awareness, and social influence as key competencies for adapting to technological disruptions and sustaining employability [2]. In parallel, key policy frameworks emphasize the educational imperative to foster such abilities. The European Commission underscores creativity and collaboration as essential competencies for lifelong learning, highlighting their role in personal development, social participation, and economic integration [3].

Entrepreneurship education has thus emerged as a strategic pedagogical approach to develop these competencies. By promoting opportunity recognition, creative problem-solving, and adaptive thinking, it prepares learners to navigate uncertainty and build innovative pathways in digitally driven economies. While recent research increasingly explores the integration of large language models (LLMs) in educational settings, investigations into their potential to support creativity-centered entrepreneurship education remain limited.

LLMs, based on natural language processing (NLP) technologies, can generate, analyze, and respond to human language with high contextual sensitivity. These tools offer real-time feedback, personalized content delivery, and dialogic interaction that may foster learners' creativity and problem-solving capacities. However, characterizing LLMs as "akin to human cognition" is conceptually ambiguous, as their operations rely on probabilistic models and transformer-based deep learning architectures, which differ significantly from biological cognitive systems. Despite this distinction, the pedagogical affordances of LLMs suggest their promising utility in creative and entrepreneurial education [4].

This literature review aimed to analyze the technical characteristics and educational impact of LLMs, while also exploring the models and case studies related to their application in entrepreneurship education. Additionally, it investigates methods for fostering creativity in entrepreneurship education through LLMs and, based on identified limitations and areas for improvement, offers insights into designing creative entrepreneurship education suitable for the digital era.

The study addresses the following research questions:

1. What are the technical characteristics and educational effects of LLMs in the field of education?
2. What models and case studies illustrate the application of LLMs in entrepreneurship education?
3. How do existing studies conceptualize and report the role of LLMs in fostering creativity within entrepreneurship education?

The paper is structured as follows: Section 1 introduces the background and significance of the research, emphasizing the importance of developing creativity in entrepreneurship education in the digital era. It also highlights the potential of LLMs in creative learning environments and clarifies the study's objectives. Section 2 provided a literature review, analyzed the relationship between entrepreneurship and creativity, and discussed the potential applications of LLMs in entrepreneurship education. It explores how LLMs contribute to fostering creativity and identifies gaps in existing research, underscoring the need for systematic analysis. Section 3 outlines the research methodology, explaining the study's design based on the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) framework. The research process includes identifying, screening, evaluating eligibility, and including the relevant literature, followed by data analysis and a discussion of the study's limitations. Section 4 presents the research findings, focusing on the educational effects of LLMs, their applications in entrepreneurship education, and

their impact on creativity development. Section 5 discusses the findings in relation to the existing literature and derives theoretical and practical implications for creativity-centered education using LLMs. Finally, Section 6 concludes by summarizing the key findings, emphasizing the potential of LLMs in entrepreneurship education and creativity development, and suggesting directions for future research.

2. Literature Review

2.1. *The Concept and Objectives of Entrepreneurship Education*

Entrepreneurship education has evolved from a narrow focus on start-up creation to a more holistic approach aimed at fostering adaptive and innovative thinking. Cantillon viewed the entrepreneur as one who purchases goods at uncertain prices and sells them while bearing risks, emphasizing the ability to manage uncertainty [5]. Schumpeter and Swedberg [6] defined entrepreneurs as catalysts of economic innovation through the process of creative destruction. Drucker [7] described entrepreneurship as systematic innovation, and Stevenson [8] characterized it as the pursuit of opportunities regardless of current resources.

These classical definitions highlight that entrepreneurship is not solely about founding new ventures but about opportunity recognition, value creation, and innovation. Consequently, entrepreneurship education should equip learners with the cognitive, emotional, and strategic competencies required to navigate uncertainty, develop creative ideas, and transform them into actionable outcomes. It must go beyond teaching technical or managerial skills and instead focus on cultivating entrepreneurial mindsets, including self-efficacy, resilience, and creativity.

In the digital age, these competencies are increasingly shaped by learners' ability to engage with complex technologies and data environments. Therefore, entrepreneurship education must evolve to incorporate technological literacy, creative problem-solving, and adaptability as core learning outcomes [9,10].

2.2. *Creativity as a Core Competency in Entrepreneurship*

Creativity is widely recognized as a central driver of entrepreneurial behavior and innovation. It is commonly defined as the ability to produce ideas that are novel, useful, and contextually relevant [11]. In the entrepreneurial context, creativity enables individuals to identify latent opportunities, generate unconventional solutions, and reframe complex problems in ways that challenge existing paradigms. Schumpeter and Swedberg [6] conceptualized creativity as the catalyst for “new combinations” that disrupt economic equilibrium through innovation. Similarly, Drucker [7] framed entrepreneurship as a process of systematic innovation, while Stevenson [8] emphasized opportunity recognition under resource constraints—both inherently reliant on creative thinking.

In educational settings, creativity is not merely a cognitive attribute or innate talent but a dynamic process that can be nurtured through intentional instructional design. Csikszentmihalyi [12] argued that creativity emerges from the interaction of three elements: the domain (the set of symbolic rules and procedures), the field (the gatekeepers of a domain), and the person (the individual contributing to the domain). His theory of “flow” further explains how optimal psychological states, marked by full immersion and intrinsic motivation, enhance creative engagement—a condition essential for entrepreneurial ideation and risk-taking behavior.

Amabile [13] extended this perspective by identifying intrinsic motivation as a core psychological driver of creative performance. In this view, learners are more likely to engage in creative exploration when they are driven by interest, curiosity, or internal goals rather than external rewards. This aligns directly with the aims of

entrepreneurship education, which seeks to foster self-directed learning, initiative-taking, and resilience.

Moreover, creativity is increasingly regarded as both an outcome and a process in entrepreneurship education. As an outcome, it reflects learners' ability to produce innovative solutions and value propositions. As a process, it involves iterative problem-solving, experimentation, and adaptive learning. This dual role makes creativity not only a pedagogical goal but also an instructional strategy, guiding learners to navigate ambiguity, manage failure, and develop entrepreneurial identity in volatile environments.

In the context of digital transformation, fostering creativity has become more critical than ever. Technological acceleration and the rise in AI-driven industries require future entrepreneurs to possess not only technical skills but also the creative agility to adapt, innovate, and lead. Consequently, entrepreneurship education must evolve to provide learners with environments that stimulate creative inquiry, support divergent thinking, and enable real-world application of novel ideas.

2.3. Educational Applications of LLMs

LLMs, as a key advancement within the broader field of artificial intelligence, have begun to reshape educational practices through their capabilities in NLP, real-time dialogic interaction, and knowledge generation. In the context of entrepreneurship education, these models serve as digital cognitive partners that facilitate personalized learning pathways, formative feedback loops, and support for complex, ill-structured problem-solving tasks [14,15].

One of the most promising affordances of LLMs is their capacity to simulate authentic entrepreneurial experiences. Through interactive prompts and adaptive outputs, learners can test business hypotheses, generate persuasive pitch content, and refine strategic ideas in a safe, iterative environment. Filippi and Motyl [15] demonstrated that LLM-based simulations significantly increase learner engagement and promote the transfer of learning to real-world contexts, particularly in engineering and entrepreneurship domains. Similarly, Burton and O'Neal [16] reported that learners using LLMs were better able to analyze market trends, identify opportunities, and develop context-sensitive solutions—core elements of entrepreneurial thinking.

Despite these benefits, the educational utility of LLMs is contingent upon appropriate instructional scaffolding and pedagogical design. Wang et al. [14] emphasized that the quality, relevance, and creativity of AI-generated outputs are highly sensitive to the design of prompts—necessitating explicit instruction in prompt engineering and critical evaluation. Furthermore, integrating LLMs into education raises ethical concerns related to algorithmic opacity, data bias, and privacy risks. If left unaddressed, these issues may not only affect the equity of learning experiences but also undermine learners' capacity for independent and critical thinking.

Nonetheless, a growing body of evidence supports the value of LLMs in enhancing both cognitive and affective dimensions of entrepreneurial learning. For instance, LLMs have been shown to stimulate learner motivation, improve metacognitive engagement, and facilitate exploratory learning environments that foster creativity and innovation [17]. When strategically integrated into entrepreneurship curricula, LLMs can function not merely as content generators but as dynamic learning mediators—providing students with opportunities to prototype ideas, receive formative feedback, and engage in reflective, high-order thinking.

To maximize their potential, educators must adopt a balanced approach that combines the computational affordances of LLMs with human-centered pedagogical principles. Such integration requires thoughtful instructional frameworks, including co-creation tasks, re-

flective scaffolds, and ethical guidelines that position LLMs as tools for augmentation rather than substitution. In doing so, LLMs can become integral to cultivating entrepreneurial mindsets suited to the demands of the digital era.

2.4. The Intersection of LLMs and Creativity: Applying a Conceptual Framework

This study analyzed how LLMs contribute to the development of creativity in entrepreneurship education, applying the five-component framework proposed by Wingström et al. [18], which conceptualizes creativity through the interrelated elements of Actor, Process, Outcome, Domain, and Space. This framework provided a multidimensional lens through which the creative affordances of LLMs in digitally mediated learning environments were analyzed.

- **Actor:** Traditionally, creativity has been considered a uniquely human capacity. However, LLMs can function as co-creative agents, assisting learners in idea generation and iterative refinement. In specific contexts, LLMs may be regarded as semi-autonomous actors capable of contributing to the creative process through dialogic and generative interactions [19,20].
- **Process:** Creativity involves both divergent and convergent thinking, encompassing the generation, exploration, and refinement of ideas. LLMs facilitate these cognitive processes by recognizing patterns, suggesting alternatives, and providing structured feedback based on vast language datasets. Their iterative capabilities position them as catalysts in recursive creative cycles.
- **Outcome:** Creative outputs encompass novel and contextually relevant ideas, products, or solutions. LLMs have demonstrated potential to produce original and coherent textual content, either independently or collaboratively, contributing substantively to the creation of linguistic artifacts in educational and entrepreneurial settings [21].
- **Domain:** Creativity is situated within specific knowledge domains, which shape the standards by which creative outputs are judged. LLMs can generate domain-specific content and facilitate interdisciplinary applications, making them effective tools for navigating complex, field-oriented problems and for supporting contextual innovation.
- **Space:** Creative activity is embedded within physical, social, and digital environments. In digital learning spaces, LLMs serve as mediators of collaborative creativity, enabling interactions among learners, educators, and instructional content. Their integration enhances participation in co-creative dialogs and supports the design of learner-centered environments conducive to innovation.

Through this conceptual framework, LLMs are understood not merely as technological instruments but as cognitive partners that extend human creativity in meaningful ways. In the context of entrepreneurship education, this perspective underscores the importance of designing instructional strategies that integrate LLMs to augment rather than replace human agency. It also provides a theoretical basis for developing curricula that cultivate creativity by leveraging human–AI collaboration.

3. Methodology

This study systematically analyzed how LLMs contribute to fostering creativity among learners in entrepreneurship education. Using the PRISMA systematic review methodology (Supplementary Materials, Table S1, PRISMA Checklist), the study evaluated the technological advancements and educational effects of LLMs and explored their specific applicability in entrepreneurship education. This systematic review protocol has been registered on the Open Science Framework (OSF) under the DOI: [<https://doi.org/10.17605/OSF.IO/E6PSU>]. The registered protocol is publicly accessible at [<https://osf.io/e6psu/> accessed on 20 April 2025].

The PRISMA methodology consists of four stages: identification, screening, eligibility, and inclusion. It is widely regarded as a suitable procedure for ensuring the systematicity and reliability of literature selection processes. Researchers conducted comprehensive searches in major academic databases using key terms such as “LLMs”, “entrepreneurship education”, “GAI”, and “Generative AI in education”. To ensure the inclusion of a sufficient quantity of relevant literature, we employed extended search strategies that included broad keyword variations, supplementary databases, and backward citation tracking. Additionally, we included empirical case studies and theoretical discussions that, while not always explicitly labeled under entrepreneurship education, provided meaningful insights into LLMs’ application in creativity and entrepreneurial learning contexts. During the screening stage, duplicate studies and papers lacking direct relevance to the subject were excluded, narrowing the scope of the initially identified materials. In the eligibility evaluation stage, the titles and abstracts of the selected papers were reviewed in-depth to exclude studies that did not align with entrepreneurship education or the use of LLMs. Finally, in the inclusion stage, papers that aligned with the study’s objectives and analytical scope were selected. These selected studies formed the basis for exploring the potential and limitations of LLMs in contributing to creativity development in entrepreneurship education (Supplementary Materials, Table S1).

3.1. Identification

In the identification stage, systematic searches were conducted in major academic databases (e.g., PubMed, Scopus, Web of Science) to locate the scholarly literature addressing the application of LLMs in entrepreneurship education. Studies focusing on general education or business activities rather than entrepreneurship education were excluded, as they did not align with the objectives of this study. To ensure a comprehensive and balanced analysis, various types of studies—including quantitative, qualitative, mixed-methods research, and literature reviews—were incorporated.

Language restrictions were applied, limiting the selection to studies published in English. This decision was made to ensure the inclusion of leading scholarly literature in the field, as most high-quality research in this area is published in English. Moreover, only studies published within the last 5 years were considered, ensuring the study’s relevance and accurately reflecting current trends. To guarantee the quality of the included literature, only peer-reviewed journal articles were selected. This measure was implemented to enhance the scientific validity and reliability of the study while excluding grey literature and unofficial sources from the review.

3.2. Screening

The databases included Scopus, JSTOR, ProQuest, DOAJ (Directory of Open Access Journals), and Google Scholar. ProQuest was selected as a primary source for management-related topics, while Scopus served as a key source with a multidisciplinary focus. The remaining databases were added as supplementary sources to ensure broader coverage of the subject [22]. Additionally, Scopus, JSTOR, and ProQuest were integrated with the university’s library system, facilitating efficient access to and retrieval of publications. DOAJ was chosen for its global accessibility to diverse open-access journals. Google Scholar expanded the search scope by including conference papers not indexed in the aforementioned databases.

The keywords used included “LLM”, “entrepreneurship”, “education”, and “Generative AI (GenAI) in education”. To ensure comprehensive coverage, both “GenAI” and “GAI” were used interchangeably during the search process, reflecting variations in terminology across the academic and industry literature. When search results were extensive, Boolean

operators such as “AND” and “OR” were combined to refine the scope. For example, search conditions like “LLM AND GenAI” or “LLM AND GAI” were used to capture a broader and more relevant set of publications. Table 1 describes the search terms and filters.

Table 1. Search terms and filters applied.

Database	Search Terms	Records Identified	Filters Applied	Records Screened
Scopus	entrepreneurship” AND “education” OR “training” AND “LLM”	8	Year: 2019–2024 Language: English	7
JSTOR	“entrepreneurship” AND “education” AND “LLM”	461	Year: 2019–2024 Language: English Academic content: Journals	129
ProQuest	“entrepreneurship” AND “education” AND “LLM”	421	Year: 2019–2024 Language: English Limit to: Full text and Peer-Reviewed Source type: Scholarly Journals Document type: Article Subject: Education	193
DOAJ	“entrepreneurship” AND “education” AND “GAI” OR “GenAI”	15	Year: 2019–2024	8
Google Scholar	“entrepreneurship education” AND “LLM”	242	Year: 2019–2024 Include: Citations	242
		1134		573

The eligibility assessment was conducted based on PRISMA guidelines, with a total of 1134 documents identified during the initial search stage. The retrieved documents were exported to Excel, where duplicates were removed. Subsequently, titles and abstracts were reviewed to exclude materials with low relevance to the research topic. No additional duplicates were identified during the manual review process. This process was independently conducted by a research team with diverse expertise across multiple fields, including two educational experts specializing in entrepreneurship education and human resource development, and an engineering expert focused on the technical applications of LLMs and GenAI. To ensure consistency and rigor, the team developed and applied a coding framework for evaluating the relevance and quality of each study. The coding scheme included four main criteria: (1) Relevance (alignment with LLMs and entrepreneurship education). (2) Methodological quality (clarity of research design, data collection, and analysis methods). (3) Creativity contribution (explicit discussion of creativity development or components such as divergent thinking, self-efficacy, or innovation). (4) Application specificity (degree to which LLMs were applied in learning environments). Each study was scored on a 3-point scale (low, moderate, high) across these dimensions. Studies with consistently low scores across multiple criteria were excluded. Reviewers coded independently and then discussed inconsistencies to reach consensus. This structured coding and validation process ensured that the final selection of studies (n = 36) was both methodologically sound and analytically relevant.

The educational experts focused on reviewing the theoretical foundations and contexts of entrepreneurship education, while the literature review specialist and the engineering expert evaluated the reliability of the research design and analyzed the technical applicability of LLMs. Each team member independently reviewed the titles and abstracts based on

their expertise, and any disagreements were resolved through discussion and consensus. During the eligibility evaluation, studies not directly related to the applicability of LLMs or entrepreneurship education were excluded. Research focusing solely on the technical analysis of LLMs without addressing the educational context of entrepreneurship, as well as studies on healthcare or business consulting unrelated to education, were also omitted. This process narrowed the initial pool of 1134 documents to 54 studies, and ultimately, 36 studies specifically addressing the use of LLMs in entrepreneurship education were selected for in-depth analysis. The multidisciplinary approach and collaborative consensus of the research team ensured the objectivity and reliability of the literature selection process. The selected studies provided the foundational data for the analysis and discussions presented in this study.

3.3. Inclusion

In the subsequent stage, 53 out of the 54 studies were accessed through the university's library system, while one study was obtained via a paid subscription. During the quality assessment process, primary sources were drawn from databases such as Scopus, JSTOR, and DOAJ, which predominantly feature peer-reviewed publications or provide peer-review filter options, such as ProQuest. To ensure rigor, an additional verification step was conducted to confirm the peer-review status of studies identified through sources like Google Scholar, which lacks a peer-review filter feature. This step involved manually verifying the peer-review status of studies retrieved from Google Scholar. Following a thorough review of the full content of the 54 collected studies, 18 studies that lacked relevance to the research focus were excluded, resulting in a final selection of 36 studies.

3.4. Data Extraction and Synthesis

Data extraction was independently performed by two reviewers. Extracted data included authors, publication year, research design, sample size, target population, types of LLMs applied, and consensus. A qualitative synthesis was conducted due to the heterogeneity of study designs and outcomes. Key themes and patterns were identified and summarized.

3.5. Risk of Bias Assessment

To evaluate the methodological quality and risk of bias of the included studies, two independent reviewers applied an adapted checklist based on the Newcastle–Ottawa Scale (NOS). The assessment focused on three domains: (1) selection of study participants, (2) comparability of study contexts, and (3) clarity of outcomes and measurements. Disagreements between reviewers were resolved through discussion. Studies scoring 7–9 points were considered high quality, while studies scoring 5–6 points were regarded as moderate quality. A summary of the selected studies is presented in Figure 1.

3.6. Data Analysis

During the analysis phase, the content of the literature was categorized and itemized according to research objectives, methodologies, and topics. To ensure the consistency and reliability required for systematic literature reviews, three researchers independently reviewed the literature and reached a final consensus through discussions. The classification of analysis items was guided by the alignment between the research questions and recurring thematic domains identified in the selected literature. Specifically, the three analysis items—(1) entrepreneurship education and creativity, (2) the application and educational effectiveness of LLMs in entrepreneurship education, and (3) the use of LLMs for creativity development—were derived inductively through iterative coding and discussion, based on the thematic convergence between research purposes and reported findings.

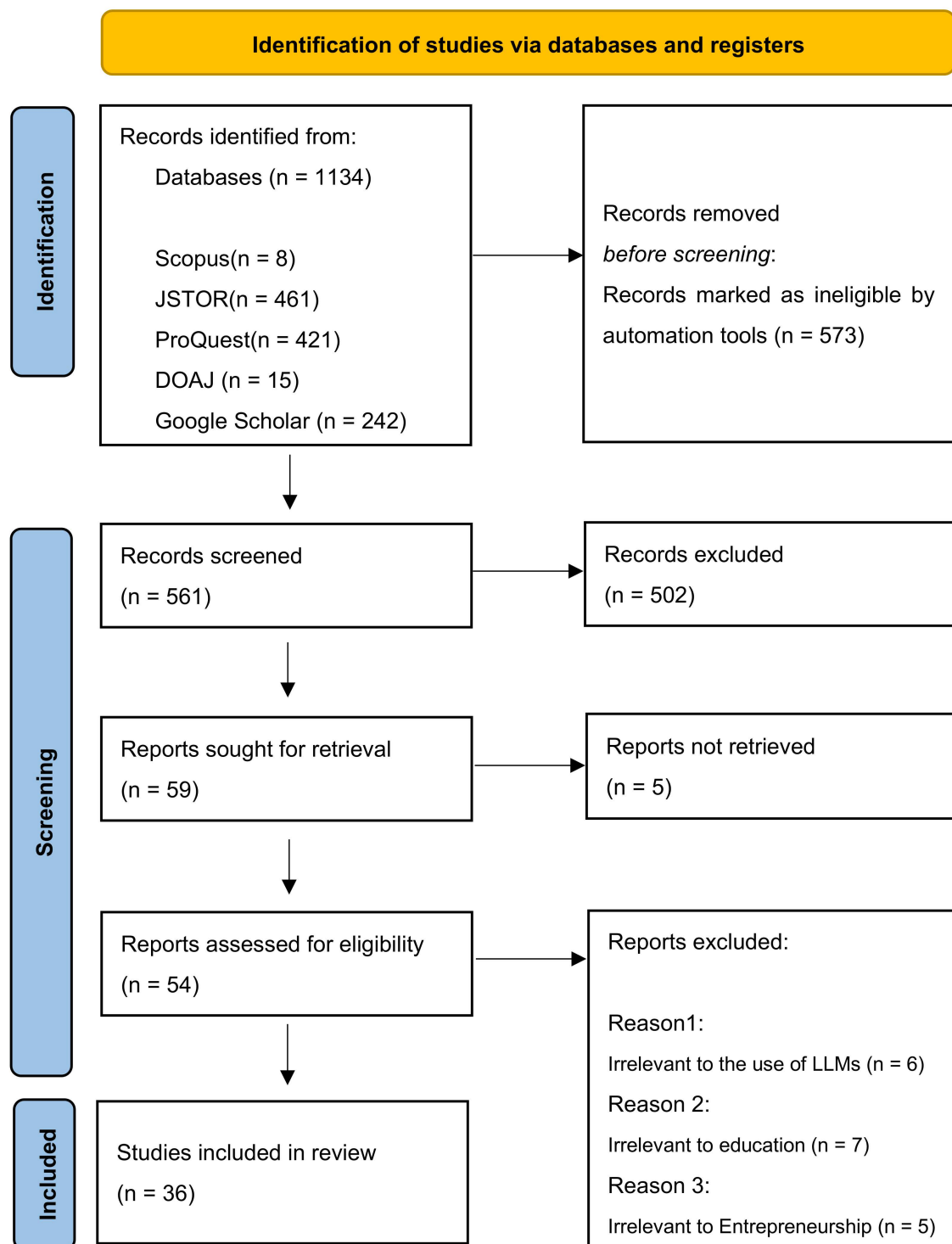


Figure 1. PRISMA 2020 flow diagram outlining the systematic review process.

Each literature source was reviewed with the understanding that it could be classified under multiple analysis items if its content addressed more than one thematic domain. Therefore, the categorization process was non-exclusive, allowing individual studies to be itemized across several categories where applicable. This ensured that complex and interdisciplinary contributions of the literature were adequately captured.

4. Results

The study analyzed the impact of LLMs on learning experiences and educational outcomes, investigating their potential applications in fostering creative thinking and problem-solving skills within the context of entrepreneurship education. To achieve this, the findings focus on the educational effectiveness of LLMs, their application cases in entrepreneurship education, and their role as tools for enhancing creativity.

4.1. Educational Effects of LLMs

LLMs drive innovative changes in learning environments, demonstrating strong potential for enhancing learning outcomes, optimizing learning settings, and boosting learner motivation. The existing literature and empirical studies indicate that LLMs serve as essential tools for reinforcing learner-centered approaches and improving educational results. LLMs contribute significantly to enhancing learning outcomes by offering personalized, learner-centered experiences. Liang et al. [17] reported that LLM-based learning improves learners' self-efficacy and cognitive engagement, leading to positive impacts on learning outcomes. Mittal et al. [23] emphasized that LLMs provide real-time, personalized feedback and suggest tailored pathways aligned with learners' goals and abilities, thereby boosting learning performance. Furthermore, Jyothy et al. [24] demonstrated that LLMs improve decision-making abilities and foster flexible thinking in solving complex learning tasks.

In addition to improving learning outcomes, LLMs exhibit remarkable potential for optimizing learning environments. Xu et al. [25] argued that LLMs facilitate a more efficient understanding of critical information by summarizing and structuring learning materials. This structured approach reduces learners' time and cognitive effort, enabling them to focus on their educational objectives. Lee and Song [26] found that AI-generated content effectively clarifies complex concepts, producing human-like or superior learning outcomes, particularly in challenging topics such as iteration. These findings suggest that LLMs enhance the accessibility and comprehensibility of learning materials, thereby improving overall learning efficiency.

Beyond offering structured learning materials, LLMs play a vital role in enhancing learner motivation. Ortega-Ochoa et al. [27] reported that LLMs address learners' emotional needs, increase engagement, and strengthen persistence in learning. Similarly, Igbokwe [28] highlighted that LLM-based AI provides personalized learning support, improving the quality of the learning process and motivating learners to actively pursue their educational goals. Such emotional support and tailored learning experiences foster trust in these tools, which is crucial for sustaining long-term motivation.

Despite their potential, technical limitations and ethical concerns present ongoing challenges. Wang et al. [14] highlighted that the quality of LLM outputs depends heavily on effective prompt design, underscoring the need for adequate training to enable learners to use these tools efficiently. Additionally, Jaouadi and Maaradji [29] expressed concerns about over-reliance on LLMs, which may weaken critical thinking and independent learning skills. They emphasized the necessity of strategic interventions and institutional support to mitigate these potential side effects.

LLMs are positioned as transformative tools for improving learning outcomes, optimizing educational environments, and enhancing learner motivation. However, systematic strategies are essential to address ethical challenges and technical limitations to fully realize their potential. To effectively harness the educational benefits of LLMs, advancements in technology must be complemented by policies and educational frameworks that support their responsible and effective use by both learners and educators. Table 2 summarizes the systematic literature review.

Table 2. Systematic literature review: Educational effects of LLMs (12).

Author (Year)	Title	Location	Methodology	Pertinent Findings
[30]	Teachers' Agency in the Era of LLM and GenAI	Taiwan	Qualitative	Enhanced digital literacy and creative participation in learning.
[26]	Teachers and Students' Perceptions of AI-Generated Concept Explanations	South Korea	Mixed Methods	Helpful for sequence and selection concepts but challenges in identifying AI-generated content.
[31]	Comparing human-made and AI-generated teaching videos	Switzerland	Quantitative	AI-generated videos matched human-made ones in learning outcomes and engagement.
[25]	AI-Generated vs. Traditional Learning Videos	China	Qualitative	Higher satisfaction and memory retention with AI-generated videos.
[32]	Understanding the Limitations and Risks of Using ChatGPT 3.0 Can Contribute to the Willingness to Use	USA	Quantitative	The positive influence of risk awareness on technology acceptance.
[33]	GenAI and Student Engagement	Bangladesh	Mixed Methods	Increased student engagement with ethical considerations highlighted.
[23]	Comprehensive Review on GenAI	India	Qualitative	Explored personalized learning and integration with immersive technologies.
[27]	Exploring the Utilization and Deficiencies of GenAI in Students' Cognitive and Emotional Needs	Spain	Qualitative	Supported cognitive and emotional needs with limitations on independent analysis.
[29]	ICT and GenAI-Powered Hybrid Model for Future Education	Italy	Qualitative	Enhanced learning experience by combining ICT and GenAI
[24]	Fogg Behavior Model for AI Adoption	India	Qualitative	Promoted motivation and learning engagement using the Fogg Behavior Model.
[17]	The Relationship between Student Interaction with GenAI and Learning Achievement	China	Quantitative	Improved learning achievement mediated by self-efficacy and cognitive engagement.
[28]	Application of AI in Education Management	Nigeria	Qualitative	AI improves educational management but requires ethical care.

4.2. Utilizing LLMs in Entrepreneurship Education: Theories and Cases

This section discusses the application of LLMs in entrepreneurship education, focusing on enhancing learners' competencies and meeting the learning demands of the digital era. The results are categorized into four themes: (1) technical features and learning

support functions of LLMs, (2) application cases and theoretical foundations, (3) support for creative problem-solving and innovative thinking, and (4) ethical challenges and technical limitations.

The technical features and learning support functions of LLMs include personalized learning, real-time feedback provision, and support for solving complex problems. These technological capabilities help learners explore new learning paths and strengthen the competencies required in the entrepreneurial process. Lan and Chen [30] stated that LLM-based learning systems provide learners with personalized experiences and support the achievement of learning goals through real-time feedback. Rahaman et al. [34] reported that LLMs assist in validating ideas and making strategic decisions during the early stages of entrepreneurship, enabling learners to confidently address challenges in complex entrepreneurial environments. Leiker et al. [35] emphasized that LLMs can revolutionize learning ecosystems by streamlining administrative processes, optimizing resource allocation, and delivering adaptive feedback. Sudirman and Rahmatillah [36] suggested that LLMs act as tools to help learners address problems in diverse cultural contexts.

Application cases and theoretical foundations show that LLMs play a crucial role in supporting creativity and innovative problem-solving in entrepreneurship education. Aggrawal and Magana [37] analyzed how LLMs provide practical assistance to learners in market analysis and business model design. Wang et al. [14] found that LLMs effectively integrate traditional entrepreneurship theories (such as Schumpeter's innovation theory) into learner-centered environments, stimulating creative thinking. Darnell and Gopalkrishnan [38] demonstrated that blending AI-based frameworks with traditional teaching methods fosters experiential learning processes. Subiyantoro et al. [39] proposed that LLMs contribute to enhancing multicultural communication skills in the global business environment.

LLMs have also emerged as key tools for stimulating creative problem-solving and innovative thinking. Deveci et al. [40] revealed that LLM-based decision support systems (DSS) contribute to resource optimization and innovation management in sustainable business management and circular economies. Vecchiarini and Somià [41] presented 499 examples of how LLMs support creativity in developing business model canvases, enabling 500 learners to turn innovative ideas into actionable outcomes. Bell and Bell [42] highlighted the role of LLMs in supporting the analytical thinking needed to solve complex business problems. Huang et al. [43] demonstrated how LLMs facilitate the effective acquisition of business resources through the use of social capital, assisting in solving complex issues.

Lastly, the ethical challenges and technical limitations of LLMs include issues such as data reliability, algorithmic bias, and technological dependency. Ismail and Sawang [44] argued that a balanced approach is necessary to ensure learners maintain critical thinking and independent problem-solving skills. Vecchiarini and Somià [41] emphasized the need for policy efforts to address ethical concerns and data reliability issues associated with LLMs. Winkler et al. [45] pointed out that tools like ChatGPT 3.0 support effective learning in educational environments but require strategies to minimize the risks of data bias and over-dependence.

LLMs are vital tools in entrepreneurship education, fostering creativity, enhancing problem-solving abilities, and developing digital competencies. They effectively support students in activities such as market analysis, business modeling, and strategic decision-making, helping them develop the skills needed to adapt to evolving business environments successfully. Systematic efforts to address ethical challenges and technical limitations are essential for the successful implementation of these technologies. The adoption of LLMs

enriches learning experiences and contributes to cultivating innovative and adaptable problem solvers. Table 3 shows the systematic literature review.

Table 3. Systematic literature review: Utilizing LLMs in entrepreneurship education (18).

Author (Year)	Title	Location	Methodology	Pertinent Findings
[37]	Exploring Teamwork Training with LLMs for Conflict Management	USA	Mixed Methods	Enhanced teamwork and conflict resolution skills through simulation.
[20]	Enhancing Students' Entrepreneurial Capacity through Marketing Simulation Games	Kuwait	Qualitative	Marketing simulation games enhance students' entrepreneurial skills by improving analytical abilities and fostering a business mindset.
[38]	Entrepreneurship Teaching Exercises: Integrating GenAI	USA	Qualitative	Promoted entrepreneurial intent and skills.
[36]	AI-Assisted Discovery Learning	Indonesia	Quantitative	ChatGPT 3.0-assisted discovery learning improves engagement, problem-solving, and creativity in entrepreneurship students.
[44]	Entrepreneurship Education, Pedagogy and Delivery	UK	Quantitative	Entrepreneurship education benefits from integrating active, experiential learning methods while addressing challenges of diverse definitions and objectives across contexts.
[45]	Evaluating Team Composition Activities with ChatGPT 3.0	UK	Qualitative	Assessed the potential of ChatGPT 3.0 as an interactive learning tool.
[14]	Turning LLMs into AI Assistants for Startups Using Prompt Patterns	Italy	Mixed Methods	Enhanced creative thinking, improved LLMs' response specificity, and enabled LLMs to act as startup mentors or co-founders.
[40]	AI-based Decision Support Systems for Sustainable Business Management Under Circular Economy	Turkey, USA, UK, and China	Qualitative	AI-based DSS supports sustainable business management and the circular economy by enabling resource optimization through data integration and efficient decision-making.
[34]	AI-Driven Decision Support for Sustainable Business	Bangladesh, Canada, Portugal, and Iran	Qualitative	Promoted ethical reasoning and technology evaluation.
[43]	A Study on Entrepreneurial Orientation and Resource Acquisition	Africa	Quantitative	Enhanced entrepreneurial skills through AI-driven personalization.

Table 3. *Cont.*

Author (Year)	Title	Location	Methodology	Pertinent Findings
[46]	Analysis of LLMs for Educational Question Classification and Generation	Indonesia	Quantitative	LLMs show promise in educational question tasks but need refinement for accuracy.
[47]	Ethical Entrepreneurship in the Age of AI	India	Mixed Methods	Ethical AI entrepreneurship balances innovation and responsibility.
[48]	LLMs in Entrepreneurship: A Survey	China	Quantitative	LLMs support entrepreneurship through innovation and efficiency
[39]	Impacts of AI-Powered Chatbots in Education	Indonesia.	Qualitative	Expanded accessibility and addressed ethical challenges in AI.
[42]	Educational Impact of GenAI on Entrepreneurship	UK and USA	Qualitative	Explored the integration of AI tools in education.
[41]	Redefining Entrepreneurship Education in the Age of AI	UK	Mixed Methods	ChatGPT 3.0 boosts efficiency and creativity in business model development but faces accuracy and reliability challenges.
[45]	Integrating AI in Entrepreneurship Education	UK and USA	Mixed Methods	Facilitated creativity and assessment in entrepreneurship education.
[49]	A Catalyst for Entrepreneurship Education in the Baltics	Russia	Qualitative	AI proficiency boosts entrepreneurial potential in Baltic universities.

4.3. LLMs in Fostering Creativity Within Entrepreneurship Education

In entrepreneurship education, creativity is a pivotal element that empowers learners to solve complex problems and transform innovative ideas into actionable outcomes. LLMs significantly contribute to fostering creative thinking by effectively supporting the five components of creativity (Actor, Process, Outcome, Domain, and Space). This section analyzed each component and the corresponding contributions of LLMs.

Firstly, LLMs assist learners in generating and executing ideas as creative actors. Shiralipoor et al. [50] noted that LLMs enable learners to explore novel approaches to creative problem-solving, while Hutasuhut et al. Reference [49] found that LLM-based learning models enhance learners' self-efficacy and facilitate the transformation of creative ideas into actionable outcomes. This support encourages learners to confidently engage in creative problem-solving.

When learners' competencies as creative actors are strengthened, the creative thinking process becomes more systematic. LLMs effectively support two critical aspects of creative thinking: divergent thinking and convergent thinking. Rahmawati et al. [10] highlighted that, in project-based learning environments, LLMs assist learners in structuring problems and exploring diverse solutions. Similarly, Maulida [9] revealed that LLMs integrate digital technologies with creative thinking, allowing learners to develop innovative business strategies. These capabilities enable learners to generate diverse ideas and transform them into actionable plans.

In this process, LLMs not only facilitate idea generation but also assist in producing original and actionable outcomes. Rosienkiewicz et al. [51] reported that LLMs help structure complex problems and support learners in proposing effective solutions in technology-focused entrepreneurship education. Olszewski et al. [11] emphasized that LLMs contribute to creative outcomes by integrating diverse ideas in collaborative settings. This outcome-centered approach ensures that learners acquire practical problem-solving skills rather than solely focusing on theoretical knowledge.

To improve the quality of these outcomes, domain-specific expertise and contextual understanding are critical. LLMs support creative activities within specific domains, enabling learners to create value relevant to their fields. Rahmawati et al. [10] analyzed how cultural collaboration and digital technology integration enhance learners' creativity. Additionally, Shiralipoor et al. [50] emphasized the role of LLMs in fostering creativity within academic contexts, assisting learners in deriving outcomes tailored to specific domains. These contributions are instrumental in fostering creativity across various industries and academic fields.

Lastly, LLMs promote interaction among learners in digital environments, fostering creative collaboration. Olszewski et al. [11] proposed that LLMs stimulate creative thinking within teamwork and collaborative contexts, while Hutahun et al. [49] highlighted the role of LLMs in enhancing the feasibility of creative ideas in digital settings. Digital collaboration, in particular, serves as an essential tool for addressing complex challenges that are difficult to resolve individually.

LLMs effectively support the components of creativity in entrepreneurship education, enabling learners to develop and apply creative thinking in dynamic environments. Specifically, LLMs provide practical assistance in generating ideas and transforming them into actionable outcomes, enhancing creative competencies in complex problem-solving and collaborative settings. However, realizing this potential requires systematic efforts to address ethical challenges and technical limitations associated with LLM usage. By overcoming these barriers, LLMs can transcend their instrumental role to become foundational elements in establishing learner-centered creative learning environments. Table 4 describes the systematic literature review.

Table 4. Systematic literature review: LLMs in fostering creativity within entrepreneurship education (6).

Author (Year)	Title	Location	Methodology	Pertinent Findings
[10]	Enhancing student competencies through entrepreneurship and cultural collaboration	Indonesia	Quantitative	Experiential and project-based learning enhance creativity, innovation, and digital skills in entrepreneurship education.
[9]	How Entrepreneurship Education Can Help Students Thrive in the Digital Age?	Indonesia	Qualitative	Digital literacy and innovative learning are pivotal for entrepreneurship education.
[11]	Modeling Accelerating Acquisition of Teamwork Competences with Transversal Competences and Artificial Intelligence	Poland	Quantitative	Teamwork and transversal competencies significantly enhance entrepreneurial skills.

Table 4. *Cont.*

Author (Year)	Title	Location	Methodology	Pertinent Findings
[51]	Enhancing Student Competencies Through Entrepreneurship and Cultural Collaboration	Indonesia	Mixed Methods	Cultural collaboration and experiential learning enhance entrepreneurial and cross-cultural skills.
[49]	A Creative Model of Entrepreneurship Learning to Improve Self-Efficacy, Entrepreneurial Intention, and Student Achievement	Indonesia	Quantitative	BBELM enhances self-efficacy and entrepreneurial intention but not academic performance.
[50]	Validation of Educational Entrepreneurship Model in Universities and Higher Education Institutions of Iran	Iran	Quantitative	Validated a systematic entrepreneurship model for higher education with strong policy and organizational support.

5. Discussion

In entrepreneurship education, creativity is emphasized as an essential competency for learners to solve innovative problems and create new opportunities [6,13]. This study analyzed how LLMs supported creativity by aligning with the five components of creativity—Actor, Process, Outcome, Domain, and Space [18]. It systematically analyzed the technical features and educational potential of LLMs in creating learner-centered creative learning environments.

LLMs demonstrate significant potential in providing personalized, learner-centered educational experiences through their technical capabilities, such as NLP, real-time feedback, and large-scale data analysis. Reference [17] that LLMs enhance learners' self-efficacy and cognitive engagement, thereby improving motivation. This finding aligns with Amabile [13]'s creativity model, which emphasizes the importance of intrinsic motivation in fostering creativity. Additionally, Lan and Chen [30] demonstrated that LLM-based learning agents effectively support learners by providing real-time feedback and dynamically adjusting learning paths. These capabilities contribute to Csikszentmihalyi [12]'s concept of flow, suggesting that LLMs can foster optimal engagement and creative thinking. Xu et al. [25] further highlighted that LLMs maximize learning efficiency by simplifying complex concepts and summarizing learning materials. Similarly, a recent European study by Griesbeck et al. [52] found that university students widely accept AI tools, report improved understanding and performance, and are aware of ethical concerns—underscoring the relevance of LLMs in enhancing learning while calling for thoughtful integration into educational contexts.

Furthermore, LLMs have proven effective in various aspects of entrepreneurship education, including creative problem-solving, technological development, and enhancing multicultural competencies. Aggrawal and Magana [37] analyzed the practical applications of LLMs in market analysis and business model design, linking their findings to Schumpeter and Swedberg [6]'s innovation theory. Wang et al. [14] emphasized that LLMs stimulate creative thinking and enhance problem-solving abilities in learner-centered environments. Deveci et al. [40] proposed that LLM-based decision support systems (DSS) optimize resources and drive innovation in sustainable business practices. Particularly, Thanasi-Boçe and Hoxha [20] demonstrated that LLMs improve learners' communication skills in multicultural settings, enhancing their adaptability in global business environments.

LLMs systematically support learners' creativity by aligning with the five components of creativity. Shiralipoor et al. [50] identified LLMs as tools that empower learners to generate and execute creative ideas as actors. Maulida [9] reported that LLMs effectively facilitate divergent and convergent thinking, enabling learners to transform innovative ideas into actionable outcomes. Rosienkiewicz et al. [51] emphasized that LLMs produce contextually relevant creative outputs within specific domains, contributing to both originality and practicality in academic and industrial fields.

Despite the promising educational affordances of LLMs, their integration into entrepreneurship education presents several ethical and pedagogical challenges that require careful consideration. One major concern is the potential for over-reliance on AI, which can lead to metacognitive laziness—a decline in learners' engagement with reflective thinking, problem-solving, and independent decision-making [15,53]. Such dependence may hinder the development of self-directed learning and diminish creative agency, both of which are essential to entrepreneurial education.

Another risk involves the homogenization of ideas. Since LLMs generate responses based on patterns in existing data, their outputs may reinforce dominant perspectives and limit the emergence of original or unconventional thinking. In this way, the use of LLMs could unintentionally suppress the diversity of thought and innovation needed in entrepreneurial learning contexts. Moreover, concerns around algorithmic bias and opaque model architectures highlight the possibility of outputs that reflect systemic inequities or cultural insensitivities, thereby undermining trust and inclusivity within learning environments.

To mitigate these risks, it is essential to implement pedagogical strategies that foster critical AI literacy. Educators should design learning environments where students are encouraged to question, evaluate, and revise AI-generated content through structured reflection, peer dialog, and human-AI co-creation tasks. Scenario-based evaluations can also help students consider ethical implications and develop independent judgment. Crucially, LLMs should be positioned not as replacements for human thinking but as augmentation tools that support creativity and exploration. When used within thoughtfully scaffolded instructional frameworks, LLMs can enhance learners' creative capacities without compromising their autonomy or critical thinking.

5.1. Theoretical Implications

This study offered significant theoretical advancement by articulating how LLMs could systematically support creativity development within the context of entrepreneurship education. It contributed to the intersection of three core domains—artificial intelligence, creativity theory, and entrepreneurship pedagogy—by analyzing how LLMs interacted with the five components of creativity: Actor, Process, Outcome, Domain, and Space [18]. While prior research has acknowledged the potential of AI in education broadly, few studies have structured this potential through a creativity-specific theoretical lens. This research fills that gap by applying a creativity framework to LLMs in a systematic literature review using PRISMA methodology.

The first theoretical contribution lies in reconceptualizing the role of LLMs as not merely instructional tools but as dynamic cognitive partners in creative learning environments. Previous studies have explored LLMs in higher education primarily in terms of acceptance or performance outcomes [52], or have evaluated generative AI as an aid in content generation or assessment design [25,30]. However, these works did not address how AI tools might interact with core psychological and educational constructs like intrinsic motivation, divergent thinking, or the iterative refinement of ideas. This paper extends existing creativity models by empirically mapping the affordances of LLMs onto creativity's

cognitive and contextual dimensions. Unlike earlier frameworks that treated creativity as a human-only trait [12,13], this study proposes that AI can facilitate and amplify the conditions under which creativity emerges, particularly in entrepreneurship education, where uncertainty and innovation are intrinsic. This represents a conceptual expansion of creativity theory to include human-AI collaboration within structured pedagogical designs.

Secondly, this research challenges existing boundaries of entrepreneurship education theory by positioning LLMs as enablers of creative agency, rather than mere automation tools. While Schumpeter and Swedberg [6] highlighted the importance of innovation and opportunity recognition in entrepreneurial action, and Stevenson [8] emphasized the pursuit of opportunity regardless of resources, these classic frameworks did not account for the possibilities introduced by AI-mediated learning environments. More recent studies focused on entrepreneurship education as a means to cultivate adaptability and problem-solving [9,10], but they did not analyze how emerging technologies reshaped these capabilities. This study demonstrates how LLMs foster entrepreneurial creativity not just through content delivery but by creating flexible digital spaces that support iteration, simulation, and exploration. For scholars, this suggests a shift in how entrepreneurial mindsets are developed, moving away from linear instructional models to more interactive and responsive environments where LLMs are actively engaged in knowledge construction.

This theoretical positioning opens new avenues for research that reconsiders the boundaries between human cognition and machine-generated input in creative tasks. It encourages scholars to investigate not only the outcomes of AI-enhanced learning but also the underlying processes of idea generation, refinement, and contextual adaptation. Future research may explore how different LLM interaction designs (e.g., co-writing, prompt engineering, collaborative ideation) influence learners' metacognitive strategies, epistemic curiosity, or domain-specific creativity. Additionally, this study invites scholars to reflect on how creativity frameworks can be updated to incorporate socio-technical systems, and how instructional design in entrepreneurship education should adapt to include AI fluency as part of core curricular competencies. Through these contributions, this paper sets the stage for rethinking both creativity theory and entrepreneurship pedagogy in a digitally mediated world.

5.2. Practical Implications

This study offers practical insights for educators, curriculum designers, and institutional leaders seeking to integrate LLMs into entrepreneurship education in ways that actively support creativity development. Rather than treating LLMs as passive information providers, this research positions them as tools that can be embedded into learner-centered pedagogies to enhance ideation, experimentation, and problem-solving—core competencies in entrepreneurial training.

For educators, one key implication is the importance of designing instructional strategies that go beyond content consumption. LLMs can be leveraged in project-based learning environments where students use them to prototype business ideas, simulate customer interactions, or explore diverse market scenarios. By prompting learners to iteratively engage with AI-generated feedback, instructors can encourage more dynamic forms of learning that promote creativity and critical reflection. Instructors are also advised to include explicit guidelines for how students should evaluate, refine, or challenge LLM outputs to prevent over-reliance and preserve independent thinking.

For curriculum developers, the study highlights the value of embedding AI literacy and prompt design into entrepreneurship programs. Equipping students with the ability to effectively interact with LLMs allows them to transform the technology into a creative collaborator rather than a static reference tool. Assignments and assessments should be

redesigned to include co-creation tasks, reflection activities, and collaborative evaluations that involve both human and AI inputs.

At the institutional level, this study suggests the need for training programs and digital infrastructure that support responsible LLM integration. Administrators should ensure equitable access to AI tools, provide faculty with resources for ethical integration, and monitor how these technologies influence student learning behaviors. By embracing the findings of this research, institutions can more effectively align technological integration with educational goals, ultimately fostering entrepreneurial graduates equipped with the creative capacities needed for digital and innovation-driven economies.

6. Conclusions

6.1. Summary

This study analyzed the impact of LLMs on creativity development in entrepreneurship education using the PRISMA systematic literature review methodology. The findings underscore the substantial potential of LLMs as learning support tools closely aligned with the components of creativity (Actor, Process, Outcome, Domain, and Space). According to prior research, LLMs enhance learners' self-efficacy [50], structure complex problems systematically [6], and provide personalized learning pathways [29], thereby contributing to fostering creative thinking. These technical characteristics and educational applications establish a foundation for learners to develop creativity and problem-solving skills in digital learning environments, particularly within the context of entrepreneurship education.

This study bridges LLM and creativity research, presenting a novel theoretical framework to understand the role of technology-based tools in entrepreneurship education. First, by investigating the interplay between the components of creativity and LLMs, this research demonstrates that creativity extends beyond human capabilities and can be amplified through technology, thereby expanding the academic scope of creativity studies. Second, it empirically validates that LLMs stimulate creative thinking and support innovative problem-solving in educational environments. By linking traditional entrepreneurship theories (e.g., Schumpeter's innovation theory and Csikszentmihalyi's flow theory) with LLM applications, this study enriches academic discourse with solid evidence. Third, it identified and critically analyzed the ethical and technical challenges of LLMs, offering balanced insights into their implications for learners' independent and critical thinking skills. These findings guide the design of educational strategies and provide a basis for future scholarly discussions.

The potential of LLMs to foster creativity suggests their transformative impact on creativity-based learning, redesigning vocational competencies, and entrepreneurship preparation. This study highlights significant implications across academic, policy, and practical dimensions:

In conclusion, LLMs hold transformative potential for fostering creativity and innovation in entrepreneurship education across academic, policy, and practical domains. This study provides a comprehensive foundation for future research and policy design, outlining specific strategies to maximize the benefits of LLMs. By addressing ethical and technical challenges systematically, LLMs can transcend their instrumental role to become integral in learner-centered educational innovation, ultimately equipping learners with creative competencies essential for navigating the digital transformation era.

6.2. Limitations and Future Research Directions

This study conducted a systematic literature review to explore how LLMs contribute to the development of creativity in learners within entrepreneurship education. Although the research utilized various databases and literature to enhance academic validity and

reliability, several limitations were identified. These limitations should be considered when interpreting and applying the findings, and they can also serve as a basis for guiding future research directions. The key limitations are as follows: First, the study has a linguistic limitation. To capture international research trends, the analysis primarily focused on literature published in English. While this approach allowed for the inclusion of the latest research, diverse academic perspectives, and global cases, it may have excluded studies written in non-English languages. As a result, the research might not fully reflect scholarly trends from non-English-speaking regions. Second, the study is subject to a temporal limitation. The analysis was restricted to literature published between 2015 and 2024 to ensure the findings' timeliness. However, this temporal restriction may have excluded significantly earlier studies, potentially overlooking foundational research in the field. Acknowledging these limitations, future research should aim to broaden the scope of analysis by incorporating literature published in various languages and extending the temporal range. Such efforts can facilitate more comprehensive and in-depth analyses, thereby enriching the understanding of LLMs' role in fostering creativity within entrepreneurship education.

Supplementary Materials: The following supporting information can be downloaded at <https://www.mdpi.com/article/10.3390/ai6050100/s1>, Table S1: PRISMA Checklist for Systematic Reviews: PRISMA 2020 Checklist.

Author Contributions: Conceptualization, S.-J.K. and J.-H.P.; methodology, S.-J.K.; validation, J.-H.P. and S.-T.L.; investigation, J.-H.P. and S.-T.L.; resources, J.-H.P. and S.-T.L.; data curation, J.-H.P. and S.-T.L.; writing—original draft preparation, J.-H.P. and S.-T.L.; writing—review and editing, S.-J.K., J.-H.P. and S.-T.L.; visualization, J.-H.P. and S.-T.L.; supervision, S.-J.K. and J.-H.P.; project administration, S.-J.K. All authors have read and agreed to the published version of the manuscript.

Funding: This research was supported by the Pukyong National University Industry–University Cooperation Foundation's 2024 Post-Doc. support project.

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Not applicable.

Data Availability Statement: The original contributions presented in this study are included in the article/Supplementary Materials. Further inquiries can be directed to the corresponding author(s).

Conflicts of Interest: The authors declare no conflicts of interest.

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