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Research on Artificial Intelligence Technology Empowering Innovation and Entrepreneurship Education in Universities

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Abstract: Digital transformation is strategic to high-quality higher education development. Rapidly evolving artificial intelligence (AI) has been widely applied in education, offering solutions to defects of conventional innovation and entrepreneurship education such as rigid teaching, lack of personalized training and scarce practical resources. Focusing on AI's empowerment for university entrepreneurship education, this paper reviews AI's educational applications and explains its four-dimensional empowering paths: fostering innovative awareness, enhancing entrepreneurial competence, deepening awareness of industrial environments, and upgrading practical training systems. It further identifies key obstacles, including backward educational concepts, inadequate digital literacy of teachers, mismatched technical resources, and prominent ethical and data security risks. Corresponding countermeasures covering conceptual renewal, top-level design, faculty training, technical optimization and regulatory improvement are put forward to boost the deep integration of AI and entrepreneurship education, and provide theoretical and practical references for cultivating innovative talents in the intelligent age.

Keywords: Artificial Intelligence Technology; Innovation and Entrepreneurship Education; Human-Machine Collaboration.

1. Introduction

From the proposal of the artificial intelligence concept in 1956 to the launch of the Transformer architecture by Vaswani et al. in 2017, which kicked off the era of large language models, generative artificial intelligence has now entered a golden period of comprehensive promotion and in-depth application. Its technological maturity, application coverage and industrial integration level keep rising, featuring four distinct characteristics: multimodal fusion, vertical subdivision, scenario-based landing and ecological development[1].

As for a technical perspective, generative artificial intelligence has evolved from single-modal text and image generation to integrated creation of text, images, audio, video, 3D models and other multimodal content. Modern models achieve remarkable improvements in contextual comprehension, logical reasoning, knowledge tracing and generation accuracy. Technological breakthroughs such as lightweight end-side deployment, integrated training and inference, and low-resource adaptation have freed AI from overreliance on supercomputing centers, realizing efficient deployment on mobile and edge devices and greatly enhancing technological accessibility and usability.

In terms of practical applications, typical "AI + Higher Education" cases released by the Ministry of Education in the past three years fully prove that artificial intelligence has been deeply embedded in higher education and become the core engine of educational digital transformation. For instance, Tsinghua University built an AI teaching assistant system for curriculum teaching. Trained on vertical corpora including textbooks and academic papers, the system realizes intelligent knowledge point analysis, personalized homework tutoring, thesis writing guidance and other functions, greatly improving teaching efficiency and learning quality. China Agricultural University developed the vertical large model "Shennong Baixiao" based on its agronomic disciplinary strengths. It adopts digital human teaching, animated video generation and practical scenario simulation to convert abstract agronomic knowledge into vivid and intuitive learning content, stimulating students' learning interest and inquiry enthusiasm. Guangzhou University constructed a full-link intelligent agent collaborative system covering "teaching-learning-assessment" for Advanced Mathematics. Supported by a matrix of six intelligent agents, it provides round-the-clock learning companions and resolves the conflict between large-scale public basic course teaching and personalized learning demands.

Considering the development trends, the integration of artificial intelligence and higher education is upgrading from isolated tool application to comprehensive reconstruction of the educational ecosystem. AI has transformed from an external auxiliary teaching tool into an intelligent participant deeply involved in teaching, learning, practice, assessment and management. It drives teaching models to shift from standardization to personalization, practical scenarios from single classrooms to virtual-real integration, and evaluation systems from result-orientation to data-driven process assessment. This also provides unprecedented technical support and practical foundation for the reform and development of university innovation and entrepreneurship education.

2. Specific Connotations of AI Empowering University Innovation and Entrepreneurship Education

Cultivating students' innovative spirit and entrepreneurial awareness lies at the core of university innovation and entrepreneurship education. The technical characteristics and functional advantages of artificial intelligence bring prominent empowering effects to this field[2], covering four all-round dimensions of innovation and entrepreneurship education: awareness, competency, scenario and practice (see

Figure 1).

Figure 1. Dimensions of Artificial Intelligence Empowering University Innovation and Entrepreneurship Education

(1) Inspiring Minds to Stimulate Innovation and Entrepreneurship Awareness

Artificial intelligence breaks the bottlenecks of traditional awareness cultivation and stimulates students' internal motivation for innovation and entrepreneurship through immersive interaction. As the starting point of all innovative and entrepreneurial activities, innovation and entrepreneurship awareness covers core elements including innovative spirit[3], entrepreneurial willingness, risk perception and sense of responsibility. Conventional awareness cultivation mainly relies on theoretical lectures and case interpretation, featuring rigid and monotonous content that fails to resonate with students or arouse their interest.

Generative artificial intelligence enables students to experience complex entrepreneurial decision-making scenarios immersively through intelligent dialogue simulation, so that they can intuitively perceive the charm and challenges of innovation and entrepreneurship. For example, Stanford University has piloted customized large language models to build a virtual entrepreneurial mentor system. The system guides students to tap potential business opportunities from daily observations and instantly evaluates the innovativeness and feasibility of proposed ideas, translating abstract innovative thinking training into tangible, interactive practical processes. This substantially lowers the cognitive threshold of innovation and entrepreneurship and effectively stimulates students' exploratory curiosity and entrepreneurial willingness[4]. In addition, artificial intelligence delivers personalized guidance tailored to individual student characteristics. Interactive discussions help students sort out their inner thoughts, gradually foster a pioneering entrepreneurial mindset, and strengthen their willingness to start businesses.

(2) Precision Empowerment to Improve Comprehensive Innovation and Entrepreneurship Competency

Artificial intelligence addresses homogenization defects in traditional competency training and enhances students' core innovation and entrepreneurship competency via personalized capacity development. As the core support for innovative and entrepreneurial activities, innovation and entrepreneurship competency includes multiple capabilities such as innovative thinking, critical thinking, problem-solving, teamwork, communication and expression, market insight and resource integration. Restricted by limited teaching resources and rigid instructional models, traditional competency training cannot realize targeted cultivation for every student, resulting in uneven competency improvement. Artificial intelligence accurately identifies strengths and weaknesses in each student's entrepreneurial competency to realize individualized instruction.

In terms of professional competency improvement, artificial intelligence provides discipline-specific entrepreneurial support: it delivers intelligent assistance for product design and technological R&D to engineering students, offers guidance on market analysis and business model construction to business students, and provides intelligent support for creative planning and brand marketing to liberal arts students. This enables students to integrate professional knowledge with innovation and entrepreneurship and consolidate their specialized entrepreneurial foundations.

In terms of comprehensive competency cultivation, artificial intelligence builds virtual collaborative platforms simulating real startup team workflows to cultivate students' teamwork and communication skills. It also simulates market research, user demand analysis and competitor evaluation to strengthen students' market insight and resource integration capabilities. By setting complex entrepreneurial challenges and emergent risk scenarios, the technology hones students' critical thinking and emergency problem-solving competencies.

(3) Scenario Analysis to Deepen Cognition of External Entrepreneurial Environments

Artificial intelligence overcomes limitations of conventional environmental cognition teaching, deepening students' understanding of entrepreneurial ecosystems through panoramic information aggregation and dynamic environmental analysis. The entrepreneurial environment refers to all external factors affecting innovative and entrepreneurial activities, covering policy, market, industrial, technological and cultural dimensions. Traditional teaching on entrepreneurial environments mainly relies on textbooks and teacher lectures, and outdated content often leaves students unable to cope with volatile and complex real-world environments during practice.

Artificial intelligence breaks information barriers with powerful data integration capabilities. By inputting specific temporal and regional parameters, it generates macroeconomic and industrial development reports customized to given contexts. More importantly, scenario deduction and comparative case analysis can simulate how fluctuations in diverse environmental variables impact entrepreneurial operations[5]. This helps students grasp the internal correlation between environmental conditions and entrepreneurship, and guides them to adjust entrepreneurial strategies dynamically in response to changing external landscapes.

(4) Simulation Empowerment to Renovate Practical Incubation Models

Artificial intelligence breaks resource bottlenecks restricting traditional practical instruction, reinforcing students' hands-on entrepreneurial competencies through simulated practical platforms and full-cycle virtual entrepreneurial simulations. Practical training constitutes the final link translating entrepreneurial awareness and competency into tangible outcomes. Traditional practical innovation and entrepreneurship teaching faces persistent pain points: scarce practical platforms, insufficient resource investment, high risks of real startup attempts, and superficial university-enterprise collaboration, leaving students with limited hands-on training opportunities. AI-powered virtual

entrepreneurship platforms effectively resolve these challenges.

Artificial intelligence assists students across the full entrepreneurial workflow: it screens project directions and generates preliminary proposals during the concept development phase, supports business model design and automatically drafts core documents such as business plans in the design stage, and constructs virtual market ecosystems during operational simulation to let students accumulate experience through full-cycle risk response drills. Furthermore, artificial intelligence connects real industrial resources and corporate demands, introducing authentic enterprise market tasks into virtual platforms. This allows students to address genuine industry needs within simulated environments, realizing seamless integration between virtual practice and real industrial ecosystems. Multiple domestic universities have launched relevant initiatives, including virtual entrepreneurship laboratories built with AI technologies, where students complete full-cycle simulations from project initiation to operational management, significantly boosting practical entrepreneurial capabilities.

Predicaments Restricting AI Empowerment of University Innovation and Entrepreneurship Education Traditional embroidery art still has wide application value in contemporary fashion design. For modern fashion design, it still has a very strong sound. First of all, we need to break the integrity of the design. Traditional embroidery art is often lack of abstractness, and the pattern image is very complete, but it has the characteristics of rigidity. It is not conducive to the long-term promotion of traditional ideas, and modern fashion design in the process of integration must break through the limitations of traditional embroidery, the integrity of the continuous to be broken, in order to innovate. For fashion designers, we can divide the patterns properly and pick up the relevant composition methods to make them more in line with modern people's clothing aesthetics. For example, when designing a dress, you can combine embroidery art to form a hollow way, so as to decorate the waist line and make the design effect of the whole curve more prominent. The second is to strengthen the aesthetic level of clothes and make them more in line with people's understanding of beauty. Traditional embroidery art is rooted in traditional culture, so the pattern is very exquisite and meticulous, which makes embroidery art unique and coquettish. It can enhance the aesthetic feeling of modern fashion design, so as to optimize contemporary fashion design. At present, many designers will actively try embroidery techniques in the process of design, so as to enhance the artistic value of clothing design, and even properly use embroidery techniques in foreign high-definition clothing, so as to further improve the quality of clothing.

3. The Application of Traditional Embroidery Art in Modern Fashion Design

Firstly, outdated educational philosophies lead to superficial integration between technology and education. Constrained by conventional mindsets, many universities merely regard artificial intelligence as a general auxiliary tool, failing to elevate its role to a strategic level for reconstructing talent cultivation systems. In the absence of top-level design, technological integration remains confined to superficial applications such as courseware production, rather than penetrating core links including teaching content, instructional models and assessment frameworks. Fragmented practical implementation thus fails to generate synergistic overall effects.

Secondly, faculty competency mismatches result in weak human-machine collaborative teaching capacity. The digital literacy and teaching paradigm transformation of current teaching staff lag far behind technological advancements. Many entrepreneurship instructors lack systematic understanding of AI fundamentals, capability boundaries and educational application models, making it difficult to integrate intelligent tools into classroom instruction, project supervision and practical training. Instructional paradigms remain teacher-centered. Teaching transformation demands that instructors shift from pure knowledge deliverers to designers and facilitators of learning processes, proficient in leveraging artificial intelligence to design scenario-based training and immersive practical exercises. Without corresponding digital teaching competencies among faculty, students cannot access high-quality human-machine collaborative learning experiences, and the transformative value of artificial intelligence remains untapped.

Thirdly, imperfect technological applications lead to inadequate and ill-adapted resource provision. Most universities rely on generic external large language models rather than vertical specialized models tailored to entrepreneurship education scenarios, which suffer from insufficient domain expertise and frequent model hallucinations. Meanwhile, high-quality teaching and practical resources are scarce and highly homogenized; AI application scenarios are largely limited to theoretical instruction, lacking sufficient depth and simulation fidelity for core practical links including project incubation and university-enterprise collaboration.

Fourthly, prominent ethical and security risks coincide with incomplete regulatory systems. Deployment of artificial intelligence across all stages of entrepreneurial education requires collection and processing of massive sensitive student data, including learning trajectories and original creative concepts. Unstandardized data management and inadequate cybersecurity defenses create risks of information leakage and unauthorized data exploitation, directly infringing upon student rights and interests. Algorithmic black boxes inherit biases embedded in training datasets, potentially generating unfair resource recommendations that compromise educational equity. Ambiguous intellectual property boundaries for AI-generated content also facilitate plagiarism and copyright infringement, undermining the core values of originality and academic integrity emphasized in entrepreneurship education.

4. Countermeasures to Advance AI Empowerment of University Innovation and Entrepreneurship Education

(1) Update Educational Philosophies and Strengthen Top-Level Design

Universities must abandon rigid knowledge indoctrination models and formulate clear top-level design frameworks to integrate artificial intelligence into every component of innovation and entrepreneurship education—including curriculum systems, instructional models, evaluation mechanisms and resource allocation—with defined integration pathways and implementation mechanisms[6].

Furthermore, universities should establish a "specialty-innovation integrated" teaching model, prioritizing AI applications that solve tangible entrepreneurial challenges rather than superficial technological stacking[7]. For instance, intelligent AI tools can be deployed to analyze and evaluate business plans or conduct market demand forecasting via generative artificial intelligence, achieving organic alignment between instructional content and technological methodologies.

(2) Restructure Faculty Competencies and Drive Teaching Paradigm Transformation

To address faculty competency mismatches, fundamental reforms to instructors' role positioning and capability frameworks are required. Universities should scale up systematic training programs to equip faculty with foundational knowledge of artificial intelligence, its functional boundaries and educational application frameworks. Specifically, instructors should participate in designing immersive AI-assisted projects that guide students to conduct real-world combat drills within simulated market environments[8]. Additionally, universities should promote dual-teacher classrooms, inviting AI technical specialists and industry entrepreneurs to co-deliver instruction and build interdisciplinary collaborative teaching teams, offsetting limitations of instructors with single-discipline backgrounds in AI implementation.

(3) Optimize Technical Support and Break Resource Barriers

Universities should reduce overreliance on generic external large models and collaborate with technology enterprises or leverage institutional disciplinary strengths to develop vertical specialized large models customized for entrepreneurship education scenarios, enhancing domain knowledge accuracy and industrial adaptability. Simultaneously, systematic integration of high-quality teaching resources and practical cases is essential to shift resource development from homogenization toward specialization and differentiation, enabling deep embedding of artificial intelligence across the full entrepreneurial education workflow to deliver precise, reliable intelligent support for students.

(4) Improve Regulatory Frameworks and Establish Risk Prevention Baselines

Universities should issue ethical codes and administrative protocols governing generative artificial intelligence applications in education, clarifying intellectual property ownership, usage boundaries and academic integrity requirements for AI-generated content to deter academic misconduct. Tiered classification and protection systems for student data must be established, with desensitization and encrypted storage applied to sensitive entrepreneurial privacy information. Comprehensive accountability tracing mechanisms should be developed to define primary responsibilities and obligations for faculty and students utilizing intelligent AI agents.

5. Conclusion

Artificial intelligence technologies deliver vital support for improving the quality and efficiency of university innovation and entrepreneurship education. Nevertheless, real-world implementation is constrained by challenges spanning conceptual awareness, faculty adaptability, technical resource allocation, and ethical data security. Universities may collaborate with technology enterprises to develop lightweight intelligent tools tailored to educational scenarios, streamlining operation workflows and lowering accessibility thresholds to enable convenient, secure AI adoption among broader cohorts of faculty and students. Institutions must establish holistic data security governance frameworks, standardizing protocols for data collection, utilization and storage while strengthening algorithmic auditing and content review to safeguard student privacy and educational equity. Sustained faculty training programs should be launched, featuring special workshops on AI instructional design, practical deployment and risk identification to accelerate instructors' adaptation to digital teaching demands. On this foundation, deep collaborative partnerships between universities, enterprises and research institutes should be fostered to build open, shared intelligent education platforms, breaking resource barriers and enabling effective alignment between technology, instruction and industrial demands. Multi-stakeholder coordinated efforts are required to construct a stable, sustainable intelligent education ecosystem, fully unlocking the transformative potential of artificial intelligence, elevating standards of innovation and entrepreneurship education, and providing robust safeguards for cultivating national innovative talents.

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