EXPLORING PATHS FOR INTEGRATING INNOVATION AND ENTREPRENEURSHIP CULTIVATION INTO MANAGEMENT COURSES UNDER THE NEW ENGINEERING BACKGROUND

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ABSTRACT

This paper explores the paths for integrating innovation and entrepreneurship cultivation into management courses under the new engineering education framework. It highlights the need to adapt management curricula to meet the challenges and opportunities posed by rapid technological advancements and industrial changes. By analyzing the current status of management education, the paper identifies several key issues, including outdated curriculum content, lack of interactive and practical teaching methods, and inadequate evaluation systems for innovation and entrepreneurship abilities. To address these issues, the paper proposes several strategies: updating course content to incorporate new engineering elements, adopting diverse teaching methods such as interactive discussions, project-based learning, and differentiated instruction, establishing a comprehensive evaluation system that includes multidimensional criteria and continuous feedback, strengthening industry collaboration through internships, mentorships, and entrepreneurial competitions, and fostering a culture of innovation and entrepreneurship on campus. Despite the potential benefits, the paper also acknowledges the challenges faced in integrating these reforms, including teacher expertise, resource constraints, curriculum integration, resistance to change, and industry cooperation. The paper concludes by emphasizing the importance of addressing these challenges and suggests future directions for research and practice to ensure the successful implementation of innovation and entrepreneurship education in management courses.

Keywords: *Innovation and Entrepreneurship Cultivation, Management Courses, New Engineering Education.*

1. Introduction

As science and technology advance at a rapid pace and industrial structures undergo continuous transformation, traditional engineering education now confronts both formidable challenges and promising opportunities. In response to these changes, new engineering education has emerged, emphasizing the close integration of engineering education with new technologies, new industries and new business models (Huang et al., 2020). It has become an important goal of colleges and universities to train high-quality engineering and technical personnel with innovative spirit, practical ability and international vision. New engineering education not only requires students to master solid professional knowledge, but also emphasizes on cultivating students' innovative thinking, entrepreneurial ability and interdisciplinary integration skills to adapt to the rapidly changing social needs and economic development (Hadgraft et al., 2019).

In this scenario, the management curriculum serves as a crucial platform for fostering students' management thinking, decision-making skills, and overall competence, playing a pivotal role in the evolution of educational content and instructional methodologies. Management courses should

not only cover traditional management knowledge such as organizational behavior, strategic management and marketing, but also incorporate innovative and entrepreneurial education concepts to cultivate students' innovative thinking, entrepreneurial awareness and problem-solving ability (Frolova et al., 2021). However, how to effectively integrate innovation and entrepreneurship training into the management curriculum is an important issue facing the current higher education reform.

The objective of this paper is to delve into the pathways of integrating innovation and entrepreneurship training within the management curriculum amidst the backdrop of the new engineering era. By conducting a thorough examination of the instructional content, teaching methodologies, and assessment systems of management courses, this paper proposes a series of reformative measures. Our aim is to nurture engineering and technical personnel who possess an innovative spirit and practical abilities, thereby enhancing their capacity for innovation and entrepreneurship, and providing robust talent support for economic and social progress. It is anticipated that this study will offer valuable insights for the reform of management curricula in higher education institutions, foster deeper integration between innovation and entrepreneurship education and management courses, and cultivate a plethora of versatile talents to meet the demands of the new era.

Analysis of the Teaching Status of Management Courses under the Background of New Engineering

Under the current educational environment, although management courses have achieved certain results in cultivating students' ability of innovation and entrepreneurship, there are still many deficiencies. These problems seriously restrict the effective support of management curriculum for innovation and entrepreneurship education under the new engineering background.

The Curriculum Content is lagging behind the Needs of Society

The teaching content of management courses often focuses on traditional management theories and methods, and lacks in-depth attention to new technologies, new industries and new business forms. With the rapid development of science and technology and the rapid upgrading of industrial structure, traditional management theories and methods have been unable to fully adapt to the current complex and changeable market environment (Zhang et al., 2024). This results in students having limited access to the latest management ideas and practice cases during their studies, creating a serious disconnect between the knowledge they acquire and the actual needs of society. This lag not only restricts students' vision, but also affects the cultivation of students' innovative thinking and entrepreneurial ability.

The Teaching Method Lacks Interaction and Practice

At present, the teaching methods of management courses are mainly lecturing, and lack of interaction and practice. Traditional lecture-based teaching is often teacher-centered and students passively accept knowledge, lacking opportunities for active participation and critical thinking (Zhang, 2020). This teaching method is difficult to stimulate students' learning interest and initiative, which hinders the cultivation of students' innovative thinking and entrepreneurial ability. In addition, management courses often neglect the importance of practical operation, resulting in students mastering theoretical knowledge, but it is difficult to transform it into actual management and innovation and entrepreneurship.

Ignoring the Evaluation System of Innovation and Entrepreneurship Ability Evaluation

The current management curriculum evaluation system overemphasizes the evaluation of theoretical knowledge, but neglects the evaluation of students' innovation and entrepreneurship ability. Traditional exams and assignments tend to focus on testing students' memory and understanding ability, and lack effective assessment of students' innovative thinking, entrepreneurial awareness

and problem-solving ability (Zhu, 2022). This evaluation system causes students to pay too much attention to the memorization of theoretical knowledge and the improvement of test-taking skills in the process of learning, while neglecting the cultivation of innovation and entrepreneurship ability. In addition, due to the lack of effective incentive and feedback mechanisms to evaluate students' innovation and entrepreneurship ability, students lack the motivation to transform theoretical knowledge into practical ability.

To sum up, the current management curriculum has shortcomings in teaching content, teaching methods and evaluation system, which is difficult to meet the requirements of innovation and entrepreneurship education under the new engineering background. Therefore, exploring effective ways to cultivate innovation and entrepreneurship ability in management courses has become an important topic in the current higher education reform.

Explore the Path of Integrating Innovation and Entrepreneurship Training into Management Curriculum under the Background of New Engineering

Under the guidance of the new engineering education concept, management courses need to actively explore the effective combination of innovation and entrepreneurship. This integration aims to train students not only with theoretical knowledge, but also with practical skills and entrepreneurial thinking, which are highly valued in the modern job market. Here's a closer look at these paths.

Updating Course Content and Integrating New Engineering Elements

In order to remain relevant in the face of rapid technological progress and industrial change, the management curriculum must be constantly revitalized to meet the changing needs of talent development under the new engineering paradigm. This can be achieved through a strategic approach that integrates cutting-edge knowledge, aligns with industry developments, promotes synergies across disciplines, and emphasizes pragmatism and vision.

First, it is crucial to embed examples of cutting-edge technologies in the management curriculum. This immersion not only enables students to understand how these technologies are revolutionizing traditional management paradigms and business workflows, but also equips them with the skills required in a modern business environment (Kartajaya et al., 2019).

Secondly, teaching materials must be constantly updated to reflect the latest industry trends, business models and market needs. For example, integrating case studies on digital transformation, sustainable business strategies and fintech innovation ensures that students are well-versed in the contemporary business environment (Brown, 2019).

In addition, interdisciplinary synergies should be promoted by promoting collaboration between management and other fields, including engineering, information technology and design thinking. This interdisciplinary approach fosters students' broader vision and comprehensive abilities, enhancing their ability to adapt and innovate. To further strengthen this, designing projects that require the application of knowledge from different disciplines, such as coordinating smart supply chains that integrate technology, logistics, and finance, can provide students with practical experience in interdisciplinary collaboration (Ivanov et al., 2019).

Finally, it is essential to emphasize pragmatism and vision. Integrating real-world case studies and simulations places theoretical concepts in a practical framework, thereby increasing students' problem-solving acumen and preparing them for practical business challenges (Abad-Segura et al., 2020). In addition, future trends incorporating management and entrepreneurship, such as sustainability, corporate social responsibility and ethical dimensions in business decision-making, will be discussed, ensuring that students are equipped with a future-oriented perspective (Markovic et al., 2021).

In conclusion, by adopting these strategies, management courses can keep up with the pace of technological advances and industrial change, thereby effectively training

talents and preparing them for the challenges and opportunities of the new engineering sanctuary.

Adopting Diverse Teaching Methods

In order to foster a thriving and innovative entrepreneurial spirit in the field of management education, the academic curriculum must integrate a range of dynamic and engaging teaching strategies adapted to the needs of the contemporary knowledge economy. The combination of these approaches not only enhances the student's learning experience, but equips them with the essential skills and mindset needed to excel in the entrepreneurial world.

Firstly, interactive teaching methods are at the forefront of this educational transformation and are a powerful tool to stimulate entrepreneurial enthusiasm. Group discussions and debates are particularly effective in developing critical thinking and perfecting communication skills, which are indispensable for aspiring business leaders. These interactions enable students to articulate ideas, scrutinize assumptions, and develop a deep understanding of complex business challenges. Role-playing exercises and business simulations provide an immersive learning journey that enables students to assume a variety of management roles and navigate real-life decision-making scenarios (Fox & Uzuegbunam, 2018). This experiential approach fosters empathy, improves problem-solving skills, and ADAPTS to the changing business environment.

Secondly, project-based learning is another cornerstone of an effective entrepreneurial education structure. By participating in the entrepreneurship program, students gain the autonomy to identify viable business opportunities, develop comprehensive business plans, and present their innovative ideas with confidence (Ferreira & Coelho, 2021). This hands-on experience mimics the entrepreneurial process, providing insight into the challenges and rewards of launching and managing a business. In addition, the analysis of real-life business case studies Bridges the gap between theory and practice, enabling students to apply classroom principles to real-world situations (Anwar & Saleem, 2022). By studying successful and failed businesses, students improve their ability to identify opportunities and develop resilience, cultivating a strong entrepreneurial mindset.

Thirdly, differentiated teaching recognizes and ADAPTS to students' different learning needs and aspirations, creating an inclusive and personalized educational environment. Personalized learning paths and resources address individual differences, offering tailored project assignments and electives that resonate with specific interests and career goals (Tomlinson & Jarvis, 2023). This approach increases student engagement and motivation as they delve into topics that align with their passions and future pursuits. The mentorship program further enrich is the learning experience by pairing students with industry experts to provide valuable guidance and feedback on their entrepreneurial projects and career aspirations (Dost & Saleem, 2022). This mentoring promotes the practical application of knowledge, gives insight into areas of expertise, and fosters a sense of belonging and purpose in the entrepreneurial community.

To sum up, the management course adopts a diversified and innovative teaching method, which can effectively cultivate students' dynamic entrepreneurial spirit and make them become future visionary leaders. The integration of interactive teaching methods, project-based learning and differentiated teaching creates an environment that fosters creativity, critical thinking and resilience, all essential characteristics of successful entrepreneurs.

Establishing a Comprehensive Evaluation System

Comprehensive evaluation system is the key to evaluate students' ability of innovation and entrepreneurship. Such a system ensures a holistic view of students' skills and an environment that fosters and effectively evaluates creativity and problem solving. By incorporating multidimensional assessment criteria, educators can gain a deeper understanding of students' abilities and provide

targeted feedback for improvement (Tkachuk, 2023).

Firstly, establish multidimensional evaluation criteria. The evaluation system should include several key aspects. First, innovation and creativity should be assessed by assessing students' ability to think creatively and design innovative solutions to business problems. This standard encourages students to think beyond traditional boundaries and develop new ideas (Amabile, 2018; Tidd et al., 2020). Second, teamwork and communication are essential skills in any entrepreneurial environment. Students should be assessed on their ability to work effectively in a team and communicate their ideas clearly (Katzenbach & Smith, 2015; Lencioni, 2015). Third, problem solving skills should be measured by assessing students' ability to apply theoretical knowledge to practical situations and effectively solve complex problems (Zhuang et al., 2023).

Secondly, establish process evaluation and feedback. Continuous evaluation is a key component of a comprehensive evaluation system. By providing timely feedback throughout the curriculum, educators can help students identify their strengths and weaknesses and promote continuous improvement (Akour & Alenezi, 2022). In addition, peer and self-evaluation should be encouraged to foster a culture of self-reflection and continuous learning. This approach not only enhances students' self-awareness, but also promotes a deeper understanding of their own learning process (Alt & Raichel, 2022).

Thirdly, increase the evaluation of the practice process. Practical assessment is essential to assess students' entrepreneurial ability. Entrepreneurial projects should be evaluated based on the originality of the idea, the feasibility of the business plan, and the student's presentation skills. This form of assessment allows students to demonstrate their abilities in the real world, providing valuable insights into their potential as future entrepreneurs.

Fourthly, work with industry to assess. Working with industry partners can further enrich the evaluation process. By providing practical assessments such as internship assessments or feedback from industry mentors, students are exposed to real-world business environments and gain valuable insights from industry experts. This collaboration not only improves the relevance of the assessment, but also provides students with networking opportunities and practical experience.

To sum up, establishing a comprehensive evaluation system is the key to evaluate students' innovation and entrepreneurship ability. The system integrates multi-faceted assessment criteria, including creativity, teamwork, communication and problem solving skills, ensuring a holistic view of students' abilities. Through continuous process evaluation and feedback, educators can promote self-reflection and continuous improvement in students. The emphasis on practical assessment and collaboration with industry partners further enhances the relevance and effectiveness of the assessment system, providing students with real-world insights and networking opportunities. This comprehensive approach not only assesses students' current abilities, but also fosters their potential to become future entrepreneurs.

Strengthening Industry Collaboration and Practical Opportunities

Working with industry partners and providing practical opportunities are the cornerstones of enhancing students' innovation and entrepreneurship. This combination of academia and industry not only Bridges the gap between theory and practice, but also cultivates a new generation of entrepreneurs with real-world skills and insight.

Firstly, use industry to guide educational programs and navigate the complexities of the business world. Industry mentoring programs play a key role in this collaborative framework. By establishing a robust network of mentors, educational institutions can receive valuable guidance from experienced industry professionals. These mentors impart their wisdom on entrepreneurial projects, career planning, and industry nuances, thereby enabling students to more effectively navigate the complexities of the business world (Kuratko Morris, 2024).

Mentoring relationships foster a culture of mentoring that goes beyond mere advice and fosters resilience and adaptability in students.

Secondly, increase hands-on experience in real-world Settings by establishing internships and collaborative programs with industry. Internships and co-op programs provide students with an immersive pathway to gain hands-on experience. Through strategic partnerships with companies, educational institutions can provide students with the opportunity to work in a real business environment. This experiential learning improves their practical skills and deepens their understanding of industry dynamics, preparing them for future challenges (Padilla-Angulo et al., 2019). In addition, industry-sponsored programs serve as catalysts for innovation, providing students with the resources, mentorship, and real-world questions necessary to develop entrepreneurial thinking and action.

Thirdly, by participating in entrepreneurial competitions in cooperation with the industry, it becomes a platform for the generation and verification of ideas. Entrepreneurship competition is an effective platform to cultivate students' innovation and entrepreneurship. By organizing such events, educational institutions create a vibrant ecosystem where students can present their business ideas, receive constructive feedback, and potentially access funding or other resources (Kariv, 2019). Students are encouraged to participate in external competitions to further expand students' networks and expose them to different perspectives and valuable experiences.

Fourthly, foster a culture of innovation and entrepreneurship by working with industry. The innovation and entrepreneurial culture of colleges and universities is crucial to cultivating students' entrepreneurial spirit. This can be done by supporting the formation of startup clubs and student organizations focused on innovation, entrepreneurship and business development (Winkler et al., 2019). Workshops and seminars are held regularly, inviting guest speakers from industry to provide students with inspiration, practical advice, and a platform to further develop their ideas and skills. These activities foster a sense of community and collaboration and encourage students to think creatively and take risks.

Fifthly, work with industry to create a comprehensive startup ecosystem: education programs, incubators, and accelerators. To create a comprehensive entrepreneurial ecosystem, educational institutions should develop on-campus entrepreneurship education programs for all students (Morris, 2022). These courses should combine theoretical knowledge with practical experience to lay a solid foundation for students' entrepreneurship. In addition, establishing campus incubators and accelerators can provide students with key resources such as office space, mentoring, and financing opportunities to start a business. Celebrate the success stories of alumni and current students who have started businesses, inspiring others to follow in their footsteps, while fostering a culture that sees failure as an opportunity to learn and grow, encouraging students to take risks and learn from their experiences (Rajapakse, 2023).

To sum up, strengthening industry cooperation and providing practical opportunities are strategic ways to enhance students' innovation and entrepreneurship ability. By leveraging industry mentoring programs, internships, co-op programs, and entrepreneurship competitions, colleges and universities can create a vibrant learning environment that promotes entrepreneurial thinking and action. In addition, fostering a culture of innovation and entrepreneurship through clubs, workshops and seminars, and building a comprehensive entrepreneurial ecosystem through educational programs, incubators and accelerators helps to nurture a new generation of entrepreneurs who are ready to tackle real-world challenges.

Fostering a Culture of Innovation and Entrepreneurship

Creating an environment that encourages innovation and entrepreneurship is critical to developing the next generation of business leaders. An entrepreneurial mindset is critical not only in driving economic growth, but

also in fostering creative problem solving and adaptability, skills that are increasingly important in today's rapidly evolving job market (Kennard, 2021). To foster such an environment, educational institutions must adopt comprehensive strategies that seamlessly integrate entrepreneurship into their core curriculum and campus culture.

Firstly, create entrepreneurial clubs and student organizations. One innovative strategy is to promote the formation of entrepreneurial clubs and student organizations. These groups can be dynamic hubs for students who are passionate about innovation, entrepreneurship, and business development. By organizing regular seminars, workshops, and guest lectures featuring industry leaders, these organizations can provide students with inspiration, practical advice, and valuable networking opportunities (Kuratko & Hodgetts, 2017). Stanford's Startup Club, for example, regularly invites successful entrepreneurs to share their experiences, challenges, and strategies, fostering a vibrant and thriving startup community on campus.

Secondly, encourage students to join campus entrepreneurship programs. In addition to student-led initiatives, institutions should develop comprehensive on-campus entrepreneurship education programs for all students, regardless of their major. These programs should include courses such as business model development, market analysis, and venture capital to provide students with the basic knowledge and skills needed to start a business (Kansheba & Wald, 2020). In addition, establishing campus incubators and accelerators can provide students with the necessary resources to start a business, including office space, mentorship, and financing opportunities. The Startup Lab at the University of California, Berkeley, is an example of this approach, offering a range of support services that have successfully helped numerous student-led businesses grow and prosper.

Thirdly, strengthen the cultivation of innovation and entrepreneurship psychology to cultivate students' resilience. To further encourage entrepreneurial thinking, schools should showcase the entrepreneurial success stories of alumni and current students. These stories can inspire others to pursue their ideas and highlight the tangible benefits of entrepreneurship (Robinson et al., 2016). It's also important to foster a culture that sees failure as an opportunity to learn and grow. By encouraging students to take risks and learn from their experiences, colleges and universities can foster a resilient and adaptable entrepreneurial spirit (Shepherd & Gruber, 2021). This approach can help students understand that setbacks are a natural part of the entrepreneurial journey and should not be seen as a barrier to future success.

By implementing these innovative strategies, management programs can effectively combine the cultivation of innovation and entrepreneurship to prepare students for the challenges and opportunities of the 21st century job market. Through a combination of student-led organizations, campus-wide programs, and a supportive cultural environment, educational institutions can develop the entrepreneurial mindset and skills necessary for students to become the next generation of business leaders.

Challenges Faced in Integrating Innovation and Entrepreneurship Cultivation into Management Courses

Although there is great potential for incorporating innovation and entrepreneurship training into management curricula within the new engineering education framework, several obstacles prevent the effective implementation of such reforms. Addressing these challenges is critical to ensuring the seamless integration and long-term sustainability of these initiatives.

Teacher Expertise and Professional Development

A significant challenge lies in the lack of expertise of teachers in the field of innovation and entrepreneurship. Many management teachers may lack formal education or practical experience in these areas, hampering their ability to effectively teach and mentor students. In addition, the rapid pace of technological advances and industry development requires ongoing faculty development to keep up with

current trends and best practices. To overcome this, institutions must invest in comprehensive training programs and provide opportunities for faculty to gain hands-on experience in innovation and entrepreneurship.

Resource Constraint

Another major obstacle is limited resources. Integrating innovation and entrepreneurship nurturing into management programs often requires additional resources, including funding for entrepreneurial programs, access to industry mentors, and specialized infrastructure such as incubators and accelerators. Inadequate resources undermine the effectiveness of these initiatives and limit the opportunities available to students. To mitigate this, agencies should seek outside funding, build partnerships with industry, and creatively use available resources to maximize their impact.

Curriculum Integration

Incorporating innovation and entrepreneurship into existing management curricula can be complex and time-consuming. It requires careful coordination between individual courses and departments to ensure a cohesive and well-rounded learning experience (Anubhav et al., 2024). In addition, it is crucial to strike a balance between traditional management content and innovative entrepreneurship education to avoid overwhelming students or diluting the core objectives of the curriculum. To achieve this, institutions should adopt a phased approach to curriculum integration, starting with pilot projects and gradually expanding based on feedback and results.

Resistance to Change

Resistance to change by faculty, administrators and students also poses significant challenges. Traditional teaching methods and evaluation systems may be entrenched, leading to reluctance to adopt new approaches (Van Wyngaarden et al., 2024). Overcoming this resistance will require strong leadership, clear communication of benefits, and continued support for teachers and students during the transition. Institutions should foster an open and inclusive culture that encourages experimentation, risk-taking, and continuous improvement.

The Challenge of Cooperation

Establishing and maintaining effective collaborations with industry partners can be challenging. Differences in goals, expectations, and culture between academic institutions and businesses can lead to poor communication and inefficiencies. Building strong, mutually beneficial partnerships requires constant communication, adaptability, and a clear understanding of each partner's contributions and benefits. To facilitate this, agencies should establish dedicated teams to manage collaboration, set clear expectations and goals, and regularly evaluate progress to ensure alignment with agency goals.

To sum up, integrating innovation and entrepreneurship training into management curriculum under the new engineering education framework has great potential, but it is also fraught with some challenges. Key barriers include lack of faculty expertise and professional development, resource constraints, difficulties in curriculum integration, resistance to change, and the challenge of collaborating with industry partners. Overcoming these challenges requires a multifaceted approach. Institutions must invest in comprehensive teacher training programs and provide opportunities for hands-on experience. They should also seek outside funding, build strong industry partnerships, and use existing resources creatively. A phased approach to curriculum integration, coupled with strong leadership and clear communication of benefits, can help manage the transition and mitigate resistance to change. In addition, building dedicated teams to facilitate collaboration and maintain clear expectations and goals is essential for a successful partnership. Addressing these challenges is critical to ensuring the seamless integration and long-term sustainability of innovation and entrepreneurship initiatives in management education.

2. Conclusion and Future Directions

Integrating the cultivation of innovation and entrepreneurship into the management

curriculum in the new engineering context is necessary to prepare students for a rapidly changing business environment. By updating course content, adopting diversified teaching methods, establishing a comprehensive evaluation system, strengthening industry collaboration, and creating a supportive culture, colleges and universities can effectively cultivate students' entrepreneurial thinking and skills.

However, a number of challenges must be addressed to ensure the successful implementation of these reforms. Teacher expertise and training, resource constraints, curriculum integration, resistance to change, and barriers to collaboration are all key issues that require attention and strategic planning. To overcome these challenges, future research should focus on developing and testing innovative teaching methods and assessment systems, particularly for the needs of managing curricula in the new engineering environment. In addition, studying effective teacher development programs and strategies to promote industry-university-research collaboration will provide valuable insights.

In addition, universities should invest resources and infrastructure to support innovative entrepreneurship education, such as campus incubators, accelerators, and entrepreneurship programs. These initiatives not only provide students with hands-on opportunities to develop their skills, but also contribute to the institution's overall entrepreneurial ecosystem.

Ultimately, we aim to create a well-rounded educational environment that fosters students' management skills and creativity, innovation and entrepreneurship. By doing so, we can prepare the next generation of business leaders to thrive in a dynamic and evolving global economy.

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