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Exploration and Practice of Innovation and Entrepreneurship Education Models in Vocational Colleges Based on the Integration of Specialization and Innovation

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Abstract:
This paper addresses the challenges faced by vocational colleges in the realm of innovation and entrepreneurship education, proposing a model based on the integration of specialization and innovation. Drawing from Outcome-Based Education (OBE) theory, symbiosis theory, and constructivism, and grounded in the practical experiences of Guangzhou Civil Aviation College, the study constructs a sustainable "specialization-innovation integration" education mechanism. This mechanism includes optimizing talent cultivation plans, offering a series of courses on innovation and entrepreneurship, deeply integrating innovation and entrepreneurship education with specialized education, establishing a comprehensive system of innovation and entrepreneurship competitions, and fostering an innovation and entrepreneurship ecosystem at the departmental level to create a conducive atmosphere. The practice has demonstrated that this model significantly enhances student engagement, fosters multiple student entrepreneurs, and has resulted in numerous provincial awards and venture capital investments. The integration model offers a new approach for vocational colleges to cultivate innovative and versatile talent, effectively improving the quality of talent cultivation, aligning vocational education with societal needs, and providing robust support for the development of high-level specialized groups.

Keywords:
specialization-innovation integration, innovation and entrepreneurship, talent cultivation, vocational education

1. Introduction

In September 2014, Premier Li Keqiang issued a call for "mass entrepreneurship and innovation" at the Summer Davos Forum. During the 18th National Congress of the Communist Party of China, General Secretary Xi Jinping emphasized that "scientific and technological innovation is a strategic support for enhancing social productivity and comprehensive national strength, and it must be placed at the core of the country's overall development." He stressed the importance of following a path of indigenous innovation with Chinese characteristics and implementing an innovation-driven development strategy. In 2015, the State Council issued the "Implementation Opinions on Deepening the Reform of Innovation and Entrepreneurship Education in Higher Education Institutions" (Guo Ban Fa [2015] No. 3), which stated: "Each university should, in accordance with their talent cultivation goals and the objectives of innovation and entrepreneurship education,

promote the organic integration of professional education with innovation and entrepreneurship education, adjust the curriculum structure, explore and enrich the resources for innovation and entrepreneurship education in various professional courses, and strengthen innovation and entrepreneurship education in the process of imparting professional knowledge."

The report of the 20th National Congress emphasized that innovation is the primary driving force and underscored the need to maintain its central position in China's modernization efforts. Young students, known for their imagination and creativity, are considered a vital force in innovation and entrepreneurship. As the main platform for talent cultivation, universities play an irreplaceable role in fostering students' innovative spirit, entrepreneurial awareness, and innovation and entrepreneurship skills. The report also highlighted the importance of establishing a scientific view of education and educational goals, focusing on cultivating high-end talent with an international perspective, innovative spirit, entrepreneurial abilities, and social responsibility. It proposed specific measures such as creating diverse educational entities, improving the curriculum system, and building practical platforms to promote the comprehensive development of innovation and entrepreneurship education.

Vocational colleges, as key institutions for cultivating technical and skilled talents, play a crucial role in innovation and entrepreneurship education. Their flexible educational mechanisms enable them to quickly respond to market demands, adjust program offerings, and better serve the needs of innovation and entrepreneurship education. However, the long-standing emphasis on exam-oriented education in China has led to a lack of creativity among students. Additionally, the generally modest academic foundation of vocational students makes it challenging to implement innovation and entrepreneurship education. The diverse student demographics and institutional characteristics of each vocational college have resulted in unique and ongoing explorations in innovation and entrepreneurship education [1].

The integration of innovation and entrepreneurship education with professional education, abbreviated as "specialization-innovation integration," is a significant trend in educational reform in vocational colleges. On the one hand, it helps improve the quality of talent cultivation by combining professional knowledge with innovation and entrepreneurship skills. On the other hand, this education model meets the economic and social demands for high-quality innovation and entrepreneurship talents, thereby promoting the comprehensive development of vocational colleges.

2. Current State of Research on Innovation and Entrepreneurship Education in Vocational Colleges

The integration of specialized and entrepreneurial education, known as "specialization-innovation integration," is both a focal point and a challenge in contemporary innovation and entrepreneurship education. This approach emphasizes combining specialized knowledge and skills with the cultivation of students' innovative spirit, entrepreneurial awareness, and entrepreneurial capabilities. Its core objective is to inspire students' intrinsic motivation and develop high-quality technical talents equipped with innovative thinking and entrepreneurial skills, aligning with the demands of economic and social development. Specialization-innovation integration is primarily manifested in three aspects: (1) Interdisciplinary Approach: This breaks the boundaries of

traditional professional education, enabling cross-disciplinary and cross-field knowledge integration, thereby enhancing students' comprehensive skills.(2)Practical Orientation: It emphasizes practical education and experiential learning, using project-based learning and case studies to enhance students' innovation abilities through hands-on experiences. (3) Collaborative Nature: This approach promotes school-enterprise cooperation, industry-education integration, and collaborative talent cultivation, creating a close alignment between the educational and industrial sectors.

The research on innovation and entrepreneurship education models in Chinese vocational colleges shows a trend towards diversification, each with distinct characteristics. The key areas include:

(1)Curriculum Reform: This involves adding innovation and entrepreneurship courses to the curriculum, integrating them with professional education to form an interdisciplinary curriculum system. For example, Jin Lin et al. discussed the issues in innovation and entrepreneurship education within the printing media technology major and proposed a curriculum system guided by innovative methods [2].

(2)Building Practical Platforms: Various departments collaborate to create practical platforms for innovation and entrepreneurship, encompassing cultural activities, research and innovation platforms, entrepreneurial training centers, and on-campus and off-campus practice bases. Zhu Jiaying et al. developed a three-in-one innovation and entrepreneurship practice platform that integrates foundational professional teaching, on-campus practical teaching, and off-campus practice bases [3].

(3)Innovative Teaching Methods: Methods such as project-based learning and case teaching are employed to cultivate students' abilities to apply professional knowledge to solve real-world problems. For instance, Wang Sheng et al. applied the PDCA cycle and task-driven project teaching methods in software testing technology courses to foster the integration of theoretical knowledge with practical applications [4].

3. Common Issues in Innovation and Entrepreneurship Education in Vocational Colleges

Despite efforts to promote innovation and entrepreneurship education, vocational colleges face several challenges:

(1)Insufficient Awareness of the Importance of Innovation and Entrepreneurship Education: Vocational students generally have weaker foundational skills, particularly in areas like learning ability, independence, creativity, and problem-solving skills, compared to university students. Innovation and entrepreneurship require high professional and soft skills, making it difficult for most vocational students to engage confidently. Additionally, many leaders and teachers in vocational colleges doubt the suitability of these students for innovation and entrepreneurship. Although many institutions have established innovation and entrepreneurship colleges or centers to oversee these efforts, some still place these responsibilities under less specialized departments such as admissions, research, or academic affairs.

(2)Lack of Effective Incentive Mechanisms: According to the "2023 National College Student Competition Analysis Report" released by the Chinese Society of Higher Education, top competitions such as the China International College Students' Innovation and Entrepreneurship Competition, the "Challenge Cup" National

College Student Extracurricular Academic Science and Technology Competition, and the "Challenge Cup" China College Student Business Plan Competition highlight the significance of innovation and entrepreneurship. However, achieving outstanding results in these competitions is challenging compared to other academic competitions. Without incentives for teachers and students, educators may prefer to guide students in other professional competitions rather than innovation and entrepreneurship events.

(3)Disconnection Between Innovation and Entrepreneurship Education and Professional Education: High levels of professional knowledge and skills are essential for innovation and entrepreneurship. However, the current professional curriculum in vocational colleges often lacks integration with innovation and entrepreneurship, limiting these courses to basic entrepreneurial concepts. Most professional teachers lack industry experience, let alone entrepreneurial experience, making it challenging to incorporate entrepreneurial activities into professional courses. This disconnect leads to the common issue of "two separate systems" in dual innovation education.

(4)Lack of Long-Term Mechanisms for Innovation and Entrepreneurship Activities: Many vocational colleges primarily engage students in innovation and entrepreneurship through competitions such as the China International College Students' Innovation Competition and the "Challenge Cup" Business Plan Competition. These events often have strict timelines, leading to short-term preparation and a strong emphasis on achieving results. However, the number of projects and students representing their schools in provincial competitions is often very limited, failing to meet the broader goal of "mass entrepreneurship and innovation."

4. Theoretical Foundations of Specialized-Innovation Integration

Specialized-Innovation Integration emphasizes incorporating specialized knowledge throughout the innovation and entrepreneurship process. The primary theoretical foundations of this approach include:

(1)Outcome-Based Education (OBE) Theory: Developed by American educator William Spady in the late 1980s, OBE focuses on designing and implementing educational processes based on desired learning outcomes [5]. In the context of specialized-innovation integration, OBE theory is applied to precisely define talent cultivation goals, design more effective curricula and teaching activities, and ensure that students genuinely acquire the ability to transform specialized knowledge into entrepreneurial skills.

(2)Symbiosis Theory: The term "symbiosis" was first introduced by German botanist Anton de Bary in 1879 to describe the close physiological relationships between different species [6]. From the perspective of symbiosis theory, Wu Yufen proposed four mechanisms essential for "specialized-innovation integration": the mechanism of conceptual alignment, multi-stakeholder collaboration, balanced interests, and shared resources [7].

(3)Constructivism: Initially proposed by Jean Piaget and later expanded by scholars such as Lev Vygotsky, constructivism emphasizes a student-centered approach [5]. This theory advocates for shifting students from being passive recipients of external stimuli and knowledge to active processors of information and constructors of knowledge. It also calls for teachers to transition from being mere transmitters of knowledge to facilitators and supporters of students' active meaning-making processes. In the context of innovation and

entrepreneurship, constructivism underscores the importance of active learning and reflection, where students engage in situational learning and project-based practice to build new cognitive structures.

5. Establishing a Sustainable Innovation and Entrepreneurship Education Mechanism in Vocational Colleges through Specialized-Innovation Integration

Having worked on the frontlines of the industry for 17 years, the author began organizing students to participate in innovation and entrepreneurship competitions at Guangzhou Civil Aviation College in 2012. Over the past decade, a sustainable innovation and entrepreneurship education mechanism based on "specialized-innovation integration" has been developed, along with a comprehensive competition system.

5.1 Optimizing the Computer Science Talent Training Program and Introducing a Series of Innovation and Entrepreneurship Courses

The computer science program at our institution offers specializations in big data technology, web development, and cloud computing. From the second to the fifth semester, we introduce a series of courses focused on innovation and entrepreneurship, including IT Professional Skills, IT Innovation and Creativity, IT Entrepreneurship Projects, and IT Project Management. These courses complement the professional curriculum, aiming to develop students' professional conduct, creativity, entrepreneurial mindset, and management abilities. For instance, IT Professional Skills trains students in self-discipline and time management; IT Innovation and Creativity fosters creative thinking; IT Entrepreneurship Projects teaches students to identify business opportunities and draft business plans; and IT Project Management aligns with the graduation project to give students experience in project management. The effectiveness of these courses is assessed through competitions and internships, preparing students for future employment and entrepreneurial endeavors.

5.2 Integrating Innovation and Entrepreneurship Education with Professional Education to Enhance Students' Skills

With the increasing technical demands of innovation and entrepreneurship competitions such as the China International College Students' Innovation and Entrepreneurship Competition and the "Challenge Cup" China College Students Entrepreneurship Competition, our computer science program leverages its technological strengths. Students are guided to identify entrepreneurial opportunities and apply their knowledge in software development, cloud computing, big data, and artificial intelligence to develop competition projects. This comprehensive practice deepens students' understanding and application of computer science, thereby achieving the integration of innovation and entrepreneurship education with professional education.

5.3 Developing a Comprehensive Competition System for Sustainable Innovation and Entrepreneurship Education

We have established a pyramid-shaped competition system that reflects the different stages and depths of entrepreneurial education, progressing from idea generation in the first year to actual entrepreneurship. The base level involves first-year students participating in the "Golden Idea" competition to stimulate creative

thinking. The second level involves selecting potential students for the "Maker Bootcamp" for intensive entrepreneurial training. The third level supports project incubation through college-level innovation and entrepreneurship training programs, refining projects over a year. The fourth level focuses on second-year students, who are the main participants in competitions such as the China International College Students' Innovation and Entrepreneurship Competition, the "Challenge Cup," the National E-commerce "Innovation, Creativity and Entrepreneurship" Challenge, and the "Xuechuang Cup" National Entrepreneurship Simulation Competition. At the top level, third-year students with entrepreneurial aspirations are encouraged to pursue real entrepreneurship.

To address the practical challenges faced by vocational students in entrepreneurship, we also conduct activities such as comprehensive skill training, innovation and entrepreneurship guidance, and "Maker Bootcamps" as extracurricular programs. These initiatives aim to enhance students' innovation awareness, problem-solving skills, and self-analysis abilities.

5.4 Establishing an Ecosystem for Innovation and Entrepreneurship Competitions within the Secondary College

Led by secondary college leadership, professional instructors and student counselors collaborate with the Student Union's academic and publicity departments to create a top-down ecosystem for innovation and entrepreneurship competitions. This system involves all majors and students from first to third years, fostering a strong culture of innovation and entrepreneurship. The ecosystem encourages cross-class and cross-discipline team formation, promoting team spirit and comprehensive skills through competition participation.

Since 2018, the author has organized seven consecutive college-level innovation and entrepreneurship competitions and five "Golden Idea" creative competitions within the secondary college at Guangzhou Civil Aviation College. The competitions have seen enthusiastic participation, with students forming cross-class and cross-discipline teams. Over 5,000 students have participated, with a participation rate exceeding 70%. The competitions have resulted in over ten provincial-level awards and six successful student-run businesses, attracting over ten million yuan in venture capital. The comprehensive innovation and entrepreneurship education system has been extended to other colleges within the institution, significantly advancing the college's innovation and entrepreneurship education and supporting the development of high-level professional clusters.

6. Conclusion

Our computer science program is part of Guangdong Province's second batch of high-level professional clusters in electronic information engineering. As we are currently in a critical phase of building high-level professional clusters, innovation and entrepreneurship education is a vital means of enhancing the quality and depth of dual-high construction. The author's extensive exploration and practice in specialized-innovation integration demonstrate that this approach is a crucial pathway for improving the overall level of innovation and entrepreneurship education. The specialized-innovation integration model provides new strategies and methods for vocational colleges to cultivate innovative and versatile talents, improving the quality of talent training and aligning vocational education with the demands of economic and social development.

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