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Exploration of "Dual-Innovation and Application-Oriented Talent Cultivation" in Intelligent Construction Major

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Abstract: The goal of "innovation and entrepreneurship technical application talent cultivation" in the intelligent construction major is to focus on employment and innovation and entrepreneurship while learning professional skills, increase employment opportunities, alleviate the problem of difficult employment, and ensure sustainable talent cultivation. The "inverted" training mode, which involves internship and practical experience in enterprises first, followed by classroom theoretical learning, is adopted. It helps each student establish learning goals, stimulates students' learning subjectivity, exploration, and persistence, cultivates students' sense of gain, achievement, and pride in the learning process, and trains high-quality technical and skilled talents who possess solid professional technical skills, innovative thinking, entrepreneurial awareness, and practical abilities. These talents are able to meet the needs of industry positions and have comprehensive abilities in technological improvement, project practice, job innovation, and self-employment.

Keywords: Intelligent Construction; Talent Cultivation; Innovation and Entrepreneurship; Inverted Form

1. Introduction

Influenced by the laws of economic development, various industries in China and even globally have entered a period of steady development. The demand for talent has shifted from quantity to quality, and from single to comprehensive advancement. For the same position, the demand for talent is becoming increasingly high. For the construction industry, the large-scale development in the past few years has already met market demand. The macroeconomic regulation of the country has greatly reduced the development volume, and the demand for industry talents has also sharply decreased. Therefore, major universities have carried out a series of reforms in order to recruit students and find employment, such as changing the names of majors, changing "construction engineering" and "civil engineering" to "intelligent construction" in order to catch up with the "intelligent" and "AI" era, and offering a series of "intelligent" and "AI" courses. Even some universities, under the pressure of enrollment, have directly deleted this major. However, "clothing, food, housing, and transportation" are the four essential elements that have been indispensable since the beginning of human history. Although existing housing meets market demand, people's requirements for the quality of living conditions are constantly increasing, and there is still a gap between existing housing and people's demand for high quality and high experience; Furthermore, the market requires a large number of professional talents for the renovation of existing houses, optimization and renovation of old communities, decoration and renovation of existing housing, and optimization of elderly care housing. And the industries related to this series also require relevant talents. As some education experts have pointed out, education should not change according to the market.

Education cultivates talents for better social development, to improve people's lives, and to realize individual value. It should not be linked to the economy. Therefore, the author believes that the cultivation of talents in the construction industry cannot be relaxed. In order to meet people's demand for a better life, the construction industry should adjust its talent cultivation strategy and cultivate talents that meet the needs of today's society.

2. The Current Employment Situation of Vocational College Students

The employment market reflects the demand for talent, which is related to school enrollment and reflects the adaptability of talent training mode quality to social demand. Based on a sample survey of approximately 170000 people, the core

finding of the "2026 China Vocational College Student Employment Report" released by the Michelson Research Institute is that the employment of vocational college students is becoming more pragmatic and diversified, the value of skills is being revalued by the market, and job satisfaction (84%) has surpassed that of undergraduate students (81%) for the first time.

The 2026 vocational green card majors (with high demand and good employment) released in the report [1] focus on technical skill based fields, including railway locomotive operation and maintenance in the transportation sector, petrochemical technology, power plants and power systems, applied chemical technology, power system automation technology in the energy and chemical sector, and industrial process automation technology in the automation sector. In 2025, the employment of vocational college students in the construction industry will show a two-way differentiation trend of "traditional job contraction and emerging technology job rise", with an overall employment rate remaining above average, but structural contradictions are prominent. [1]

The salary of graduates majoring in civil engineering remains at a medium to high level, but due to industry adjustments, the job satisfaction of traditional positions such as construction and real estate is relatively low, which means that high pay and low job identity coexist. The demand for employment in the industry has shifted from "building houses" to "managing data and using machines" for technical personnel. The demand for basic positions such as construction workers has shrunk, and emerging positions such as BIM engineers, intelligent construction technicians, digital construction managers, and drone surveyors are in high demand. Cross border industries such as smart fire maintenance, welding robot debugging, and building data annotation have become new blue oceans.

To turn the tide, it is necessary to actively adapt to the trend of "AI+construction", transform from "labor-intensive" to "digital craftsmen", master the combination of "construction profession+BIM/drone/basic programming", and seize overseas development opportunities.

3. Analysis of the Reasons for Difficulties in Employment in Higher Vocational Education

According to a survey [2], the main reasons for the difficulty of employment for vocational college students in the intelligent construction industry today are concentrated in the following aspects: firstly, economic globalization has led to a significant reduction in the use of labor by enterprises, resulting in widespread shutdowns, vacations, and layoffs, and a tendency towards cautious employment by enterprises; The second is the impact of the current situation of higher education. The popularization of higher education and the expansion of the scale of higher education have led to oversupply, and under the condition of exam oriented education, there are problems such as poor practicality of curriculum design, emphasis on knowledge over ability in teaching methods, difficulty in abandoning professional curriculum design, repetitive course content design, and insufficient professional employment guidance. [2] Thirdly, students' learning and growth methods lag behind the development of society, and graduates tend to have inaccurate employment positioning, high expectations, and picky job choices.

The survey found that, from the perspective of individual graduates, there are several issues with difficulty in finding employment.

3.1 Graduates have a Single Knowledge Structure

The survey shows that some students have one-way, linear, planar, closed, and low functional knowledge structures [2] Specifically, it is reflected in the emphasis on professional knowledge, limited to a certain professional field, and a lack of comprehensive theoretical and knowledge cultivation in both arts and sciences. Graduates who only master knowledge from books and lack hands-on abilities have a complex, loose, isolated, rigid, and inflexible knowledge system, lack systematic and organic connections, lack innovative vitality, and do not meet the diversified and comprehensive talent needs of enterprises.

3.2 Graduates Lack Practical Abilities

A survey shows that graduates lack the ability to combine theory with practice, and there is a situation of "having education but no ability", often requiring years of training to adapt to the work environment.

3.3 Inaccurate Employment Positioning for Graduates

The relevant research results show that some

graduates lack sufficient understanding of the external employment environment. Lack of understanding of the macroeconomic environment, the development pattern of the industry to which this major belongs, market demand for employment, and future development trends, and unclear about the true level of competitors among job seekers. At the same time, many students lack objective self reflection, are not clear about their actual mastery level of professional knowledge, and fail to rationally view personal personality, interests, and family economic conditions, ultimately leading to unrealistic employment expectations. Some students have a high self positioning and have not changed their career mentality in a timely manner. They still hold the psychological superiority of college graduates and lack the awareness of humble learning. When I first entered society, my practical accumulation and comprehensive abilities were still insufficient, and I could not meet the predetermined standards in my heart. It was difficult to make realistic choices in job selection and salary treatment. [3]

4. Exploration of the Talent Training Model for "Double Innovation Technology Application"

4.1 Characteristics of talent cultivation mode

To promote employment and narrow the gap between the employment ability of college students and the demand for social positions, the "dual innovation technology application-oriented talent training" model can be explored. 'Double innovation' refers to innovation and entrepreneurship, and the attitude and ability towards' double innovation 'are qualities. We strive to cultivate a group of talents with critical spirit and independent ability, always pursuing lofty ideals and surpassing goals. Our goal is to shape students' innovative and entrepreneurial personality, adhere to creativity as the root, entrepreneurship as the foundation, student-centered, ability oriented, employment based, and cultivate students' innovative consciousness, creative spirit, entrepreneurial ability, and excellent character based on their professional background. Linking the development education of cultivating students' potential with their future career development, encouraging students to "start their own businesses" and find flexible employment, establishing "one person" companies, and adhering to the concepts of "light assets, heavy services" and "light scale, heavy content", fully tapping and releasing students' individual potential, cultivating good personalities, laying a good foundation for their future development, expanding their development directions, and also helping to solve the structural unemployment of college students. The purpose of cultivating "double innovation technology application-oriented talents" is to shape the innovative and entrepreneurial personality of college students, adhere to the creation oriented approach, take students as the main body, and be guided by their abilities. It is different from simple skills education and knowledge education, and focuses on cultivating students' innovative consciousness, creative spirit, entrepreneurial ability, and excellent character. Innovation and entrepreneurship education cannot be separated from the foundation of professional education. It is necessary to fully embed innovation and entrepreneurship education into professional education, implement deep level innovation and entrepreneurship education, and let the two permeate, influence and promote each other.

4.2 Talent Cultivation Methods

The implementation of this training model follows teaching concepts such as guidance, practicality, systematicity, openness, and the ability to transform results. It implements the teaching principle of "student participation, diverse forms, comprehensive application, and combination of learning and application", and emphasizes learning through doing, thinking through doing, and creating through thinking based on heuristic teaching, interactive teaching, problem-based teaching, case teaching, and other teaching methods. It highlights entrepreneurship simulation and innovation practice, changes the traditional classroom centered, knowledge centered, and textbook centered thinking, and achieves the integration of knowledge and technology, theory and practice, learning and practice, student ability modules and market integration. Matching needs. [2] At the same time, it is necessary to establish a quality evaluation system for the cultivation of applicable talents, strengthen students' comprehensive literacy in theoretical application and practical problem-solving, and optimize and innovate the traditional evaluation model.

Regarding student academic assessment, reform

measures should be implemented to diversify evaluation methods, streamline performance assessment processes, and diversify evaluation subjects. Realize triple transformation, that is, course assessment no longer focuses solely on exam scores, but instead focuses on students' comprehensive ability level; Student academic evaluation is no longer solely based on final results, but places greater emphasis on the complete learning process; Graduation design and thesis evaluation should also weaken the pure theoretical research orientation and highlight the examination of practical application and innovation ability. [3] In short, the design and implementation of the curriculum system, teaching methods, and teaching quality evaluation should be oriented towards students' career, practical needs, and the job market. It should not only meet the various needs of economic and social development, but also meet the different needs of students' growth and development.

4.3 "Inverted" Cultivation Mode

Nowadays, the majority of vocational colleges have a talent cultivation and curriculum setting model, which basically involves learning professional basic courses in the first year, professional courses in the second and third years, and starting graduation projects and off campus internships in the second semester of the third year. Under this mode of learning, emphasis is placed on knowledge explanation and transmission, classroom teaching, curriculum setting, and strong authority of teacher explanations. Students have limited space for independent innovation and free choice. Resulting in students learning the courses arranged in the teaching plan instead of selecting learning content based on goals or problem-solving, unable to accurately choose the required subjects, leading to low learning enthusiasm, lack of motivation, and gradually losing interest in course learning. Some students only realize after internships that certain course knowledge is important for their career development, while others only require understanding, resulting in most in class learning becoming ineffective. In order to change this inefficient learning mode, the cultivation mode of entrepreneurial technology application-oriented talents adopts the "inverted" cultivation mode. The so-called inverted mode refers to the "internship before learning, off campus before on campus, direction before content, innovation and entrepreneurship before classroom theory" mode. Students choose their professional field and graduation direction based on off campus and enterprise production internship practice and course knowledge introduction, and then select the course system according to the selected direction, adopting the "task oriented, goal oriented" learning mode.

In the first semester of my freshman year, when the awareness of "double innovation" was in its infancy, the main training venue was outside of school. Newly enrolled students are arranged for cognitive internships and production practices both on and off campus. They participate in the production process of feasibility studies, site selection, construction design, cost budgeting, and sales management of construction projects from a macro perspective. They have a macro understanding of the construction industry and are familiar with the courses and related content required in different work fields, such as construction projects involving engineering construction, architectural drawing recognition, and engineering surveying; Architectural structural design requires learning courses such as graphic recognition, architectural CAD, concrete structures, steel structures, masonry structures, building mechanics, seismic design, etc., to stimulate students' interest in the study of architectural engineering and lay a macro foundation for later completion of "double innovation" or enterprise employment requirements on campus; Strengthen students' enlightenment education on entrepreneurship and innovation, and implant strong entrepreneurial aspirations and employment goals in their minds through activities such as entrepreneurship cases and entrepreneur speeches. [2]

In the second semester of college, during the formation period of the "double innovation" goal, the main learning venue is in the classroom on campus. Based on the practical understanding of the previous semester, choose the graduation project and entrepreneurial direction, including topic selection, data collection, scheme design, and scheme evaluation. Based on the chosen direction, focus on studying courses related to that direction and continuously revise the entrepreneurial and innovative direction during the learning process. [2] During the learning process, students can independently choose their professional direction, course level, learning

progress, and implement open teaching through the deep integration of entrepreneurship and professional education according to their personal needs. Students can independently choose the course content they need to learn based on their goals, arrange their study time independently, and select courses independently across disciplines, promoting the integration of humanities and sciences, the combination of science and engineering, and the intersection of multiple disciplines in their knowledge structure, cultivating their ability to use comprehensive knowledge to solve problems. Teachers are responsible for stage task inspection, guidance, correction, suggestions, and incentives. At the same time, complete the basic courses of this subject.

In the first and second semesters of sophomore year, during the growth period of "double innovation" awareness, the main learning venue is on campus. Start comprehensive practice, comprehensively apply interdisciplinary knowledge, techniques, and methods, practice one's own entrepreneurial and innovative content on the basis of theory, listen to expert opinions, actively participate in subject competitions such as skill competitions, innovation practice competitions, and entrepreneurship competitions, participate in competition exercises, project cultivation, constantly stimulate interest and potential in reinforcement learning, and stimulate the enthusiasm of teachers and students to participate in innovation and entrepreneurship practice. At the same time, timely feedback and adjustments should be made based on the actual learning situation, industry development status, regional socio-economic development needs, and possible problems. Entrepreneurship clubs, summer schools, forums, and websites can be established to promote the progress of entrepreneurship and innovation. To cultivate and master the basic knowledge, principles, methods, and skills related to this major, and to possess the ability to engage in the design, construction, and management of this major and related engineering projects. [4]

In the first semester of my junior year, during the period of improving my awareness of entrepreneurship and innovation, I mainly studied in a combination of on campus and off campus settings. Complete the implementation of the plan, summarize and discuss, write the graduation design, study project development courses, and entrepreneurship management courses. Guide students to master project research paths and methods, and improve their ability to identify, analyze, and solve problems. [5] In addition to choosing professional courses, corresponding elective courses such as management knowledge, logistics knowledge, economics knowledge, etc. should be selected according to the needs of the work. Through the combination of in class and out of class teaching, practical innovation and professional practical education should be integrated to actively promote joint training with enterprises, so that students' entrepreneurial works can be put into practice. [5]

In the second semester of my junior year, I will be introducing my experience in summarizing and improving my entrepreneurial works. My main learning location will be outside of school. Students return to enterprises and markets to put their entrepreneurial content into practice and put it into the market. Based on theoretical learning and market feedback, they improve their entrepreneurial works, such as one person's company, one person's innovative ideas, etc. Combining comprehensive practical training both inside and outside the school, we aim to improve and explore innovative thinking, apply comprehensive knowledge to analyze and solve practical production problems, and complete the evaluation, summary, and exchange of results for innovative works.

5. Conditions for the Implementation of the "Double Innovation Technology Application oriented" Talent Training Model

5.1 Government Macroeconomic Regulation and Control

The government should improve the legal and regulatory system related to entrepreneurship and innovation technology, consolidate the legal foundation of entrepreneurship education, coordinate resources from multiple departments, and provide public services such as entrepreneurship training, policy Q&A, project evaluation, and follow-up assistance to college students. Based on the practical needs of the market, we will build a good ecosystem, introduce supporting and preferential policies, improve credit services and investment and financing service platforms, and create favorable conditions for students to participate in entrepreneurship education and carry out entrepreneurial practices. [3]

At the same time, the government needs to decentralize and implement the autonomy of universities in running schools, broaden their autonomy in discipline construction and major settings, and promote universities to adjust and optimize their major layout structure. Utilize macro policies to coordinate the collaboration between schools and enterprises, and build a diversified employment docking service platform; Introduce various incentive policies to encourage enterprises to accept college students for internships and practical training, provide policy incentives and financial subsidies to enterprises that implement internship systems, and create a high-quality practical education environment. [6,7]

5.2 Teaching Reform in Universities

Colleges and universities should integrate the educational concept of "double innovation technology application" into students' daily activities and strengthen campus cultural construction. Relying on diverse campus cultural activities to build educational practice carriers, utilizing various channels such as entrepreneurship themed lectures, entrepreneurship skills training, entrepreneurship team incubation, and innovation and entrepreneurship competitions to promote and popularize education, and deepen students' understanding and cognition of "double innovation technology application" education.[7] At the same time, encourage students to actively learn entrepreneurship related knowledge during their spare time, invite outstanding entrepreneurship project leaders to share practical experience, and take multiple measures to create a strong campus innovation and entrepreneurship culture atmosphere. Students' graduation designs can be transformed into entrepreneurial works, strengthening the establishment and improvement of the education system, enhancing the construction of school entrepreneurship bases, actively cooperating with external enterprises, expanding students' horizons, and broadening their thinking. [6,7]

5.3 Corporate Social Responsibility

As an important collaborative subject of innovation and entrepreneurship education in vocational colleges, enterprises are the core carrier for the practical cultivation of technology application-oriented talents and the landing of double innovation capabilities. [8-10]They play an irreplaceable role in the entire process of vocational talent cultivation through practical education. Compared with the theoretical teaching advantages of universities, enterprises have real industrial scenarios, cutting-edge technological resources, and market-oriented entrepreneurial operation experience, which can effectively make up for the shortcomings of vocational colleges' innovation and entrepreneurship education that emphasizes theory over practice, and help students grow into technical, innovative, and applied talents that meet the needs of the industry. [8]

In the process of talent cultivation, enterprises should actively and deeply participate in the collaborative education work between schools and enterprises. On the one hand, enterprises can rely on their own job standards, technical processes, and industry development trends to assist universities in optimizing talent training programs, participate in the development and revision of entrepreneurship courses and training materials, integrate new technologies, processes, and entrepreneurial practical experience into daily teaching, and ensure that the content of vocational entrepreneurship education meets the needs of market industry development. [9]On the other hand, enterprises need to actively build off campus training and innovation and entrepreneurship practice platforms, open production workshops, research and development studios, and project operation scenarios, and accept vocational college students to carry out on-the-job internships, project training, and innovation and entrepreneurship practical training, so that students can exercise their technical application ability, innovative thinking, and market practical ability in real positions. [10]

5.4 Close Family Support

As an important economic and spiritual support for students' growth, the family has a crucial impact on the formation and development of their worldview, values, and outlook on life. The effective implementation of student entrepreneurship education is closely related to the cooperation and support of the family. Family background has a subtle direct or indirect effect on students' employment, creativity, entrepreneurial qualities, and creative personality cultivation. Therefore, communication with students' parents should be strengthened, and the significance and various

policies of entrepreneurship should be actively promoted to assist schools in cultivating students' innovative, enterprising, independent, and risk-taking qualities, and to provide them with more opportunities for independent choice. Utilize family resources to expand the platform for cultivating applied talents in the field of "double innovation technology", share experiences, and provide spiritual support [11]

Therefore, the effective implementation of entrepreneurship and innovation education cannot be separated from the government's leadership, the participation of enterprises, the key implementation of universities, and the guarantee mechanism of full cooperation from families.

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