A STUDY ON THE CULTIVATION OF "CRAFTSMANSHIP" AMONG STUDENTS IN UNDERGRADUATE VOCATIONAL INSTITUTIONS — A CASE STUDY OF SHANDONG ENGINEERING VOCATIONAL UNIVERSITY

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Thematic Certificate

To

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This Independent Study has been Approved as a Partial Fulfillment of the Requirement of International Master of Business Administration in Education Management

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ABSTRACT

In the era of informatization, digitization, and intelligence, China's manufacturing sector is transforming from a large country to a strong country. The increasing demand for high-level technical talents in social development has led to the emergence and development of undergraduate vocational education. In 2019, the Chinese Ministry of Education established the first batch of 15 vocational undergraduate colleges and universities across China to foster the cultivation of a "craftsmanship" in applied skilled talents. The research objectives of this article are as follows: 1) To provide an effective way to cultivate the craftsmanship; 2) To provide suitable teaching reform methods for cultivating the craftsmanship; 3) To provide a suitable talent development program.

Drawing on tacit knowledge theory, collaborative education theory, and human-vocational zone matching theory, this study explores the artisan spirit and its cultivation content through a literature review. It empirically tests the index elements of the artisan spirit using a questionnaire survey, ensuring the reliability and validity of the survey instrument. Survey the overall situation of cultivating the artisan spirit among students in Shandong Engineering Vocational University as a sample. The survey results were subjected to statistical analysis using the SPSS software. The analysis included assessing the differences in various dimensions of the artisan spirit based on demographic variables of students in vocational colleges, conducting statistical analysis on the dimensions of artisan spirit characteristics, and analyzing the current status of cultivating the artisan spirit among students in vocational colleges.

This study addresses the issues related to the cultivation of craftsmanship among vocational college students and reaches the following conclusions: 1) By adopting an immersive approach that deeply engages students in the craftsmanship, their awareness and understanding of the "craftsmanship" can be enhanced, providing an effective avenue for cultivating this spirit. 2) By altering teaching content, methods, and educational outcomes, adaptable instructional reform methods are provided to

cultivate the craftsmanship. 3) By updating students' perspectives on employment, a suitable talent development program is offered to establish accurate perceptions about career paths.

Finally, the results of this study are reflected, discussed and suggested. These recommendations include establishing vocational values that align with the artisan spirit, integrating the cultivation of the artisan spirit into the entire process of vocational college education and teaching, emphasizing the impact of campus culture on the artisan spirit, strengthening the development of a faculty team with dual-teacher qualifications, and building a mechanism for deep integration of school-enterprise cooperation in education.

Keywords: undergraduate vocational education, craftsmanship, cultivation theory, highly skilled personnel

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Declaration

I, Liu Ranran, as a result of this, certify that the work embodied in this, independent study entitled "Performance evaluation study on the integration of industry-education by taking Shandong Engineering Vocational University as an example" is a result of original research and has not been submitted for a higher degree to any other university or institution.

Liu Ranran

(Liu Ranran)

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1. Introduction

1.1 Research Background

In 2016, at the fourth session of the 12th National People's Congress, Premier Li Keqiang proposed in the Government Work Report to "cultivate the spirit of craftsmanship for excellence" (Hu, 2016), and in 2017, In the report of the 19th Party Congress, General Secretary Xi clearly stated: "build an army of knowledgeable, skilled and innovative workers, promote the spirit of model workers and craftsmen, and create a social ethos of honorable labor and a culture of dedication to excellence" (Sheng, 2018). On March 5, 2018, at the first meeting of the 13th National People's Congress, Premier Li Keqiang again stated: "Carry out a comprehensive quality improvement campaign, promote benchmarking with advanced international levels, promote craftsmanship, and come to a quality revolution made in China" (Li, 2018). The latest version of the Technical Regulations for the Preparation of National Occupational Skills Standards, released in 2018, the national vocational skills standards place a particular emphasis on craftsmanship and dedication, integrating the connotation of craftsmanship and dedication as a fundamental element within the requirements for professional ethics. The advocacy of craftsmanship has risen to a high level at the federal level, which reflects that craftsmanship will have a significant impact on the national manufacturing industry as well as social and economic development, and also provides a specific value motivation and policy tone for the promotion and cultivation of craftsmanship (Sun & Qin, 2018).

In 2019, China's Ministry of Education made the first batch of 15 vocational undergraduate institutions nationwide to encourage colleges and universities to cultivate applied skilled talents with "craftsmanship", so the cultivation of craftsmanship is an essential part of the ideological and political education work of high-level technical applied skills, which is also known as vocational undergraduate education, and its shaping of the positive social energy of the glory of labor, which is conducive to promoting contemporary undergraduate vocational college students to overcome the influence of alienated labor on themselves, helping them to return to productive work with the fundamental purpose of human development, and providing a guarantee for vocational undergraduate colleges to implement the essential task of establishing moral education in order to help solve the dilemma of a severe shortage of high-quality and high-skilled talents and realize the strategy of high-quality economic development (He & Jia, 2021).

Nowadays, the state pays more and more attention to the professional quality of craftsmanship. With the development of the times, people have given a different connotation to craftsmanship, which is different from the traditional craftsmanship of pure artisans. More importantly, craftsmanship is the guiding light for a professional to grow and become successful (Jin, 2019). Therefore, this study takes the lack of craftsmanship in today's society as the background, the national policy of craftsmanship as the guide, the precipitation of craftsmanship in traditional culture as the basis, and undergraduate vocational colleges as the starting point to explore how

to promote and cultivate the craftsmanship of higher vocational students.

1.2 Research Problems

There are differences in the perception of the cultivation of the craftsmanship among vocational undergraduate students, which leads to divergent goals and directions in their pursuit of the craftsmanship. Consequently, there is a deviation in the implementation of the craftsmanship (Li & Xu, 2020). The cultivation of the craftsmanship among vocational undergraduate students has been in the exploratory stage (Zhang, 2017). Students in vocational undergraduate institutions lack proper employment goals, and their voluntary practice of the craftsmanship is not firm (Huang, 2016). After four years of pilot programs in China's initial batch of vocational undergraduate institutions, there are three main problems in the process of cultivating high-level technical and applied talents.

The penetration of the craftsmanship in the campus environment lacks infectiousness for students, and there are differences in their understanding of the cultivation of the craftsmanship. There are issues in the content, methods, and effectiveness of cultivating the craftsmanship among university students. Students lack proper employment goals, and their voluntary practice of the craftsmanship is not firm.

1.3 Objectives of the Study

The cultivation of the craftsmanship is crucial for the development of students, vocational undergraduate institutions, as well as society, and the nation (Kuang, 2018). Vocational undergraduate institutions bear the arduous task of cultivating a large number of high-skilled technical talents for the country. In order for these technical talents to establish a long-term presence in society and excel in their fields, they must be influenced and nurtured by the craftsmanship. Based on the theoretical foundation, the research objectives for cultivating the craftsmanship at Shandong Engineering Vocational University are as follows:

1. To provide an effective way to cultivate the craftsmanship.
2. To provide suitable teaching reform methods for cultivating the craftsmanship.
3. To provide a suitable talent development program.

1.4 Scope of the Study

From the perspective of undergraduate vocational education, this paper examines the approach to cultivating "craftsmanship" among students in undergraduate vocational institutions in the new era. The research focuses on two main areas: the characteristics of craftsmanship and the methods of cultivation. The attributes of craftsmanship are classified into five domains, which include professional skills, professional knowledge, professional ethics, professional attitudes, and professional beliefs. The section on cultivating craftsmanship is divided into five dimensions, namely campus culture, curriculum instruction, practical training, school-industry

collaboration, and policy framework. Through this research, we aim to assess the current status of craftsmanship cultivation among students in undergraduate vocational institutions, analyze the collected data, identify the underlying issues, pinpoint key challenges, and propose targeted optimization measures.

1.5 Research Significant

First, driven by societal demands, the integration of craftsmanship into the educational process has resulted in improved quality of higher vocational education. This integration has also enhanced the employability and competitiveness of graduates from higher vocational education institutions, thereby achieving the fundamental objectives of teaching and nurturing individuals within these institutions. Through the cultivation of higher vocational education with a craftsmanship spirit, the social image of higher education institutions has improved, and the accurate impression of society about higher vocational education is changed, which is conducive to the more reasonable and scientific development of higher vocational education and the cultivation of more skilled talents in line with the "great craftsmanship spirit" (Li & Zhao, 2018).

Second, it helps to improve the comprehensive education level of teachers. In the cultivation of craftsmanship, teachers can promote the improvement and enhancement of teaching contents, teaching methods, and curriculum settings to enhance the comprehensive education level of teachers and give full play to the critical role of teachers in cultivating highly skilled and high-quality talents (Zhang, 2017).

Third, it helps to improve the overall quality level of students and their competitiveness in employment. In today's complex and changing market environment and increasingly fierce competition for talents, "craftsmanship," as a professional spirit, plays an essential role in improving students' professionalism and enhancing their employment competitiveness (Li, 2018). To meet the practical needs of higher vocational students' self-growth and career development, "craftsmanship" is combined with the growth process of higher vocational students so that students can have "craftsmanship" such as persistence and concentration, excellence and dedication to work, which can improve their overall quality in all aspects and improve their future career. In this way, students can enhance their overall quality and stand out in future employment competitions (Wen, 2018).

2. Literatures Review

This chapter analyzes the current situation of cultivating students in undergraduate vocational education and the problems that arise in developing students with craftsmanship through a literature search. It deeply investigates the tacit knowledge theory, collaborative education theory, and human-job matching theory that supports this study. Using theoretical knowledge, we study practical ways and methods to cultivate talents, improve the quality of teaching services, and finally

achieve the cultivation of talents with high-quality technical skills and improve students' satisfaction, because of the problems that arise in the process of cultivating students with craftsmanship in undergraduate vocational institutions.

2.1 Undergraduate Vocational Education

The Bachelor of Vocational Studies is a full-time undergraduate program that awards the degree of Bachelor of Professional Studies. It represents one of the levels within China's higher education system, alongside general bachelor's degrees. Vocational undergraduate education is designed to address urgent societal needs and is characterized by distinct training objectives, curriculum, and teaching methodologies different from regular undergraduate programs. It follows an interdisciplinary approach that integrates industry, academia, and research, with training objectives aligned with the demands of society (Pan & Che, 2019).

Scholars have extensively analyzed the necessity and feasibility of cultivating students' craftsmanship within vocational undergraduate colleges, highlighting the value of craftsmanship in today's era, specifically in the context of vocational undergraduate education. Wang (2014) argues that cultivating students' craftsmanship in vocational undergraduate colleges is essential not only for China's economic transformation and development but also for the survival and growth of enterprises and vocational undergraduate institutions. Moreover, it is crucial for the personal development of college students. Zhang (2017) contends that craftsmanship is a unique characteristic of vocational undergraduate institutions and serves as a foundation for moral education. Cultivating craftsmanship is a significant driver for the transformation and advancement of vocational undergraduate colleges, contributing to the enhancement of their cultural influence and fostering career development opportunities for senior vocational students. Therefore, there is an urgent need to prioritize the cultivation of craftsmanship among senior vocational students. Li (2016), in the context of supply-side reform, investigates the cultivation of craftsmanship in vocational undergraduate colleges. The study emphasizes the importance of vigorously cultivating the craftsmanship of undergraduate vocational students, as it aligns with the diverse and high-quality material and cultural needs of consumers. Furthermore, craftsmanship catalyzes China's transition from a large manufacturing country to a strong manufacturing nation. It acts as a hidden motivational and academic force supporting this transformation.

2.2 Craftsmanship

This chapter analyzes the current situation of cultivating students in undergraduate vocational education and the problems that arise in developing students with craftsmanship through a literature search. It deeply investigates the tacit knowledge theory, collaborative education theory, and human-job matching theory that supports this study. Using theoretical knowledge, we study practical ways and methods to cultivate talents, improve the quality of teaching services, and finally

achieve the cultivation of talents with high-quality technical skills and improve students' satisfaction, because of the problems that arise in the process of cultivating students with craftsmanship in undergraduate vocational institutions.

2.2.1 Craftsmanship characteristics

The famous American sociologist Franklin (1998) first did a lot of research on professionalism. He believed that professionalism mainly includes characteristics such as restraint, moderation, diligence, thrift, and honesty. Kinjerski (2004) considers professionalism as an individual state with physical, emotional, cognitive, interpersonal, and spiritual dimensions. Several scholars have researched the significance of work ethic and have concluded that professionalism not only enhances product quality but also contributes to the overall well-being of employees. (Ashmos & Duchon, 2000). According to the German sociologist Max Weber, professionalism has been expressed in capitalist societies as a capitalist spirit that encompasses qualities such as faith and reverence, which in some writings on artisanship, can contribute to the quality of products (Max, 1992). The book "The Craftsman" by American sociologist Richard Sennett takes the working environment and nature of craftsmen as its carrier. It takes human nature as the starting point to examine the level of artisans' skills by combining their physiological functions and technical skills (Richard, 2015), and combining the labor order and ethical system. In addition, Sonnett's research on artisans is not limited to the artisan's connotations, but also goes deeper into thinking about modern society, artificial intelligence, and the future of human beings, which reflects his strong sense of security and deep humanistic sentiments (Sonnett, 2016), In his book "Craftsmanship: The Power of Great Legends", American scholar Alec Fauci points out that the scope of craftsmanship is not restricted to mere craftsmen, but also includes scientists and inventors who can innovate and think independently to solve complex problems and to operate existing technological tools with ease (Alec, 2014).

In his book "How to Cultivate Craftsmanship: This is How to Guide, train and Cultivate first-class human resources," Kazushi Akutsu tells companies, organizations, and the industry that cultivating the general quality of craftsmanship is crucial to the development of companies and the cultivation of human resources, and that for individuals, the path of refinement and the pursuit of peak craftsmanship is the most basic professional qualities for becoming craftsmen and passing on the spirit of craftsmanship (Kazushi, 2017). In his book "Craftsmanship: The Longevity Genes of Japanese Family Businesses" (Toshio, 2018), Toshio Goto analyzes 31 cases of long-lived businesses from various industries, such as Yamamoto Seaweed Shop, Fuyuga Food Shop, and Kamekawan Food Condiment Maker, and summarizes the qualities of craftsmanship that these businesses possess, such as tenacity and tirelessness, and it is because of these excellent qualities that the company has been able to continue to grow and it can be observed that the craftsmanship spirit plays a crucial role in the survival and development of enterprises. Furthermore, it is emphasized that the specific methods adopted by these enterprises to uphold the essence of craftsmanship

have significant reference value for the study of the craftsmanship spirit. In his book "30 Rules for Cultivating First-Class Talents" (Akiyama, 2015), he describes his experience in the woodworking industry and comes up with an essential criterion for cultivating craftsmanship: character is higher than skill. The meaning conveyed is that an individual's character cultivation is the key to nurturing the craftsmanship spirit, while the refinement of skills can be achieved through long-term training. Without the cultivation of noble character, the most vital technical ability cannot be called an excellent artisan.

2.2.2 Cultivation of Craftsmanship

Based on the previous discussion of the interpretation of the spirit of craftsmanship, it can be understood that the spirit of craftsmanship is an inherently positive and proactive emotional trait within individuals. This emotion is not present from the beginning but can be generated through exposure to the external environment, interactions with others, and deliberate nurturing. However, over time, various factors such as external setbacks or personal emotional distress can cause the loss of this emotional trait (Zheng, 2017).

Therefore, in this study, the objective is to facilitate the development of the positive and proactive emotions associated with the spirit of craftsmanship. This is achieved through reasonable interventions that aim to cultivate and educate the target individuals, ensuring the continuous inheritance and perpetuation of these emotions (Zhang, 2019).

With the definitions of the terms "the spirit of craftsmanship" and "cultivation" established, the meaning of "Cultivation of Craftsmanship" can be clearly understood. In short, it refers to the cultivation and education of individuals' professional spirit of pursuing excellence in their work. In this study, the target population is undergraduate students in vocational colleges who have not yet entered the workforce. Therefore, the focus is on cultivating and educating the spirit of craftsmanship among these students before they embark on their professional careers.

2.3 Cultivation Theory

2.3.1 Tacit knowledge theory

The author of the book "Individual Knowledge" published in 1958, where the concept of explicit and tacit knowledge was introduced, was the British philosopher Michael Polanyi. (Niu, Li, & Yu, 2012). For example, the folk artisan who blows the candy in his hand knows the shape of the malt candy in his heart, but he cannot tell you how to blow the candy in his heart only through words. Even if the candy blower does his best to tell you how to blow a ball of maltose into a small monkey, but you follow the knowledge of the blower's words, you still blow a mess (Polanyi, 1958). Why is this so? Because it objectively contains tacit knowledge that cannot be transmitted directly or adequately by language (Liu, 2019). The essence of tacit knowledge, exemplified by qualities like vision, discernment, skill, and creativity, is fully manifested in the diverse cognitive functions of intelligence such as

comprehension, understanding, and judgment. This bears striking resemblances to the process of nurturing craftsmanship among vocational college students. (Polanyi, 1958) To begin with, tacit knowledge can be described as personal knowledge that is deeply ingrained within an individual's behavior and primarily stems from their personal experiences. It results from a unique understanding and comprehension of experience, grasping experience, and reorganizing experience, which is increasingly enriched and continuously improved through experience accumulation (Li & Bu, 2015). Additionally, tacit knowledge is embedded in practical activities, which cannot be exhausted by propositions and words, but only the perceived, and understood in actions. In vocational institutions, the development of students' practical skills is an integral part of nurturing their craftsmanship. (Polanyi, 1958). Through school-enterprise cooperation and apprenticeship training, students' skills can progress from simple to advanced, step by step, and deepen continuously (Li, 2016).

2.3.2 Collaborative education theory

The theory of synergism comes from the idea of synergy. Helman Haken, a German physicist, first proposed the basic idea of "synergy," which holds that various systems are so different that they are independent and completely separate, such as animals and plants, agriculture and industry in society, and atoms and light in lasers. The bit and the photon in the laser, but it is the large number of independent subsystems that make the universe an open system as a whole, among which the subsystems interact and cooperate as a whole, collectively and cooperatively, following common regularity (Chen, 1987). The concepts, principles, and rules of self-organization and order of systems described in this paper have methodological implications for research and practice in many disciplines, including education.

The characteristics of vocational education determine the characteristics of professional training, and the mode of schooling must rely on industry and enterprises. The theory of collaborative education refers to the sharing of resources between schools and enterprises so that schools, enterprises, and students can realize the purpose of cultivating talents, technological research and development, and adding value to knowledge (Xu, 2013). By making full use of various social resources, industry can participate in the development of school talent development programs, and transmit the demands of the most relevant enterprises in the industry to guide schools in improving professional settings and curriculum construction so that the talents cultivated in schools can meet the actual needs of enterprise development; students can come into contact with industry enterprises during their studies, know their needs, compare their shortcomings, and determine the direction of their efforts, which is essential for their future personal development (Xue, 2013). During the study period, students can contact industry and enterprises, know their needs, compare with their shortcomings, determine the direction of their efforts, and have positive significance for their future personal development, achieving a multi-win effect for schools, enterprises, industry, students, and society. Cultivating craftsmanship in students requires knowledge and skills development in schools, practice in companies,

and industry and social ethos. (Zhang, 2018). The cultivation of the craftsmanship should be guided by the principles of synergistic education, leveraging the "synergy effect" that arises from the holistic, collective, and cooperative interaction of each subsystem within the training system. (Xu, 2013).

2.3.3 Person-job matching theory

The person-job matching theory, established by the renowned American career guidance expert John Holland, suggests that an individual's personality traits should align with the nature of the occupation. Different individuals possess their own unique personality characteristics, and these individual differences objectively exist. Each specific occupation has its own emphasis, with differences in environment, content, conditions, and nature (Edwards, Caplan, & Van, 1998). Consequently, they require different abilities, knowledge, skills, personality traits, temperament, and psychological qualities from workers. When there is a congruence in the match, the individual's characteristics and the occupation harmoniously promote and stimulate work interest, job satisfaction, and work efficiency. Conversely, a lack of fit hampers career development.

Vocational colleges bear the responsibility of cultivating highly skilled and high-quality workers. Whether they can cultivate skilled talents that meet the urgent needs of the transformation and development of the manufacturing industry also has a significant impact on the overall socio-economic development. The talent development programs and curriculum offerings of vocational colleges reflect the requirements of the socio-economic sector for specialized talents and skills. They are disciplines and majors formed based on social division of labor, aimed at cultivating specialized technical professionals and high-quality workers who strive for excellence in their work. Therefore, the educational content and the development of students' vocational abilities in vocational colleges need to align with their future career positions (Edwards, Caplan, & Van, 1998). In the process of receiving education, students will have a clearer understanding of their own abilities, interests, and career goals, making it easier for them to gain a sense of self-worth and recognition from others in their employment journey.

At the same time, the craftsmanship spirit is an excellent spiritual quality and professional demeanor that specialized technical professionals and high-quality workers should cultivate during their long-term professional practice. This quality originates from spiritual civilization, is condensed from outstanding traditional culture, and is manifested in the form of professional spirit. It represents the profound logical reasons and spiritual resources that make artisans successful (Zhang, 2018). In this sense, the craftsmanship spirit holds high value and is indispensable for vocational college students on their career paths. (Translation and citation based on APA 6th edition guidelines)

Therefore, applying the person-job matching theory, vocational college students can clarify job requirements and define their own career goals and ideals through self-awareness and analysis of job characteristics. They should strive to become skilled

professionals who excel in their work, possess a craftsman's mindset, and demonstrate exemplary conduct. By experiencing the significance of craftsmanship in their labor process, they can further affirm their social value through employment and work.

2.4 Highly skilled personnel

Highly skilled personnel, also known as "artisan craftsmen," refer to individuals who possess both a certain level of theoretical knowledge and extensive practical experience. They excel in areas where modern processing equipment cannot provide solutions or guarantees, such as on-site production processes, electromechanical maintenance, and mold manufacturing. Highly skilled personnel are excellent technical workers who can skillfully address various technical issues. The most crucial qualities of highly skilled personnel are their execution ability and operational experience. They are individuals who have undergone specialized training and possess contemporary high-level application technologies, skills, and theoretical knowledge. They demonstrate creativity and the ability to independently solve critical problems. Highly skilled personnel refer to technicians and senior technicians who have acquired specialized knowledge and operational skills (Lang, 2016).

Highly skilled personnel typically refer to senior technicians and skilled workers engaged in high-tech and labor-intensive tasks in production and service-oriented enterprises. They are required to utilize both their cognitive and manual skills, possessing advanced knowledge and innovative abilities, while also mastering proficient operational skills. Highly skilled personnel are professionals in frontline production and service who possess specialized knowledge and operational skills to solve critical technical and process-related challenges. This category primarily includes individuals who have obtained qualifications and corresponding professional ranks as advanced workers, technicians, and senior technicians (Guan & Hu, 2015).

Highly skilled personnel are individuals within human resources who possess advanced technology, advanced processes, and operational skills. They are capable of engaging in creative labor and making positive contributions to the development of socialist material civilization, spiritual civilization, and political civilization. They represent excellence in technical skills and are among the key driving forces for promoting technological innovation and the transformation of modern scientific and technological achievements into productivity. Highly skilled personnel is a relative, broad, and comprehensive concept (Liu & Ma, 2016). In addition to possessing high academic knowledge, they should also possess profound professional skills. They not only rely on skills for their work but also require the necessary theoretical knowledge to comprehensively apply their expertise in solving specific problems. Furthermore, they need to have the adaptability to handle unexpected situations on-site. They are knowledgeable and skilled frontline operators who can apply both their hands and minds, embodying a combination of comprehensive qualities and creative skills.

2.5 Theoretical framework

By applying the theory of tacit knowledge inculcation, the idea of collaborative education strengthening, and the theory of human-job matching practice, college Students can constantly experience the influence of the craftsmanship culture, promote the spirit of craftsmanship, and develop excellent qualities, regardless of time or location. Cultivate craftsmanship spirit in the "integration of industry and education." To provide students with more matching internship opportunities is aimed at improving the quality of educational services and achieving the goal of cultivating highly skilled talents.

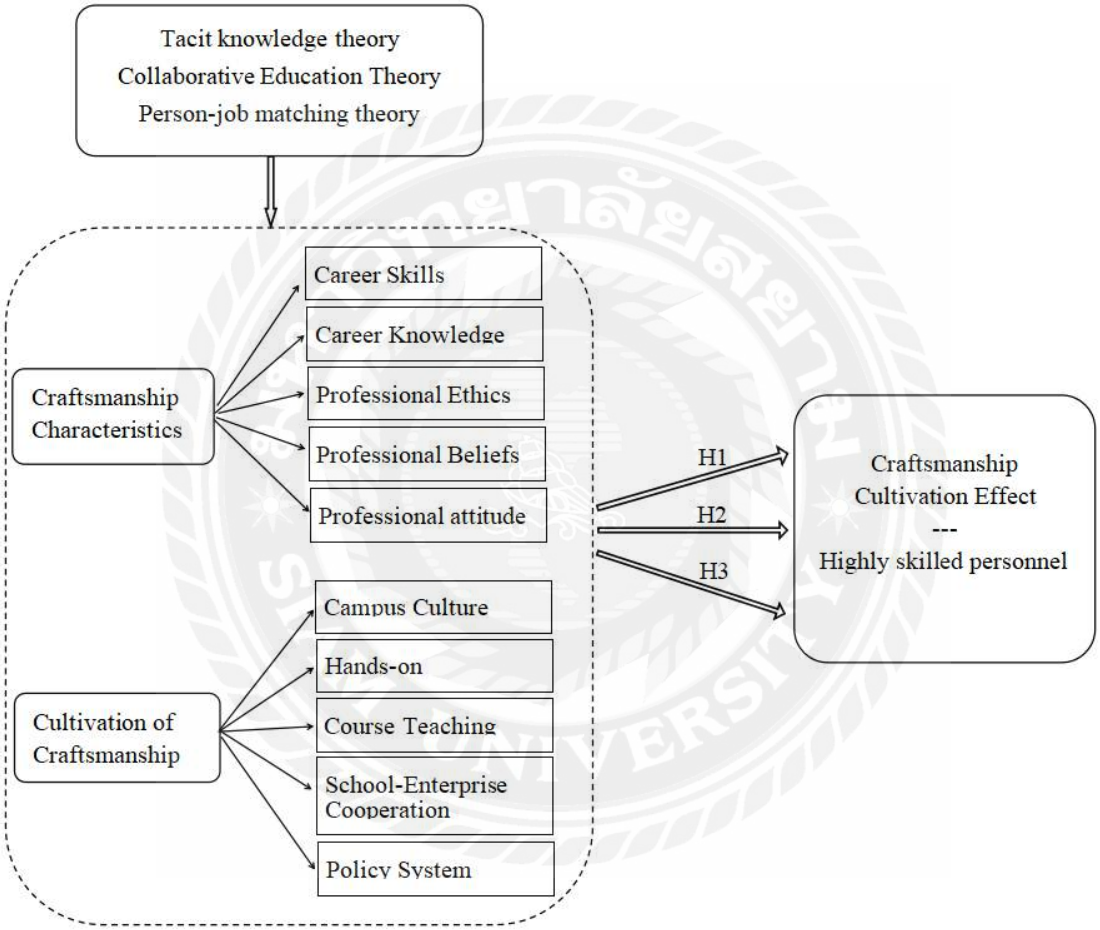

Figure 2.4 Diagram of the theoretical framework of the Study

2.6 Hypotheses

H1: There were significant differences in students' perceptions of craftsmanship inculcation by grade and gender.

H2: There are significant differences in the perception of craftsmanship among students of different majors.

H3: There is a significant difference in the perception of craftsmanship among students with or without practical training experience.

3. Research Methodology

This paper uses a quantitative research method to conduct a questionnaire survey on Shandong Engineering Vocational and Technical University, which is among the first 15 pilot undergraduate vocational institutions in China. There are 431 questionnaires collected, Completed 393 valid questionnaires, and the questionnaire return rate was 91%. The basic situation of the sample and each variable were statistically analyzed. The variables of the fundamental problem mainly included grade, gender, the primary category, and whether they had an internship and practical training experience.

The questionnaire used in this study is characterized by drawing on the questionnaire of Dr. thesis, "Research on the cultivation of professionalism among students in higher vocational colleges," and some of the questions were modified by referring to the relevant literature of other scholars (Xue, 2013). The basic content of the questionnaire was determined based on the specific implications of craftsmanship characteristics and the specific approaches to cultivation. Related questions were designed for each dimension. Before the official launch of the survey, a small group of senior vocational students was selected for a pilot test. The results of the pilot test were analyzed for reliability and validity to ensure the scientific rigor and validity of the questionnaire. This process ultimately resulted in the development of the questionnaire used in this study.

The questionnaire uses Likert 5-point scale to score each question, and each question contains five levels from "not at all" to "completely," and the score also ranges from 1 to 5 (Adelson & McCoach, 2010). The basic structure of the questionnaire consists of three parts, including the introduction, the basic situation of the sample, the characteristics of craftsmanship, and the primary condition of the cultivation of craftsmanship, etc. The final content of the questionnaire is presented in Appendix 1.

This questionnaire uses Cronbach's Alpha internal consistency coefficient to measure reliability (Brown, 2002). Using SPSS 26.0 software, the overall reliability of the entire questionnaire as well as the reliability of different dimensions of craftsmanship development were analyzed. The results are presented in Table 3.1 and Table 3.2. From Table 3.2, it is evident that the Cronbach's Alpha coefficient value for 29 items of the total questionnaire is 0.941, the Cronbach's Alpha coefficient value for 13 articles of craftsmanship characteristics is 0.877, and the Cronbach's Alpha coefficient value for 16 articles of craftsmanship cultivation is 0.925. All three values reach 0.8 or above. This suggests that the questionnaire demonstrates satisfactory reliability both overall and within each section. As depicted in Table 3.2, the reliability values of all the five dimensions of the cultivation of craftsmanship reached 0.7 or above, which indicates that the questionnaire has acceptable reliability, and combined with the reliability values of the total questionnaire, We can conclude that the questionnaire is open to further study.

Table 3.1 Reliability test of the cultivation questionnaire

Option classification	Cronbach's Alpha	Number of items
Total table	0.941	29
Craftsmanship characteristics	0.877	13
Cultivation of craftsmanship	0.925	16

Table 3.2 Reliability test for each dimension in the cultivation section

Questionnaire Content	Test content	Dimension 1	Dimension 2	Dimension 3	Dimension 4	Dimension 5	Total items
Craftsmanship Cultivation of Craftsmanship	No. of projects	3	4	4	3	2	16
	Cronbach Coefficient	0.845	0.733	0.786	0.751	0.835	0.925

The validity test was conducted in two steps. Firstly, Bartlett's sphericity test and Kaiser-Meyer-Olkin (KMO) measure were used to assess the suitability of the questionnaire for factor analysis. Subsequently, the structural validity of the questionnaire was examined. Correlation analysis was performed between each dimension and the total questionnaire, and the findings are presented in Tables 3.3 and 3.4.

They defined according to statistician Kaiser's (1974) view on whether different KMO values enable factor analysis. According to the results in Table 3.3, the KMO value is 0.949, which has excellent factor analysis fitness, and Bartlett's sphericity test for the probability of partnership Sig has a value of 0.000, which is less than the 0.001 level of significance indicating that the questionnaire in this study is suitable for factor analysis.

As can be seen from the results in Table 3.4, the correlation coefficient between each dimension and the total are all greater than 0.7 ($P < 0.01$), which is highly correlated, indicating that the relationship between each side of the questionnaire and the whole is relatively strong. In addition, the correlation coefficients between the five measurements were also between 0.45-0.75 ($p<0.01$), which were medium to high correlations, indicating that the relationship between the five dimensions of the questionnaire was relatively close and still was good discrimination between each size.

The results of the KMO values of the factor analysis and the coefficient values of the correlation analysis lead to the conclusion that the structure of the questionnaire on the cultivation of craftsmanship meets the measurement requirements and has good

structural validity.

Table 3.3 KMO values of the Craftsmanship Cultivation Questionnaire

A sampling of sufficient degrees of Kaiser-Meyer-Olkin	Metrics	0.949
Bartlett, the sphericity test	Approximate cardinality	5927.408
	df	406
	Sig.	0.000

Table 3.4 Correlation coefficients between the measurements of the cultivation component

Questionnaire content	Composition Dimension	Dimension 1	Dimension 2	Dimension 3	Dimension 4	Dimension 5	Total items
Craftsmanship Cultivation	Dimension 1	1.000					
	Dimension 2	0.560**	1.000				
	Dimension 3	0.708**	0.710**	1.000			
	Dimension 4	0.576**	0.585**	0.660**	1.000		
	Dimension 5	0.753**	0.472**	0.664**	0.537**	1.000	
	Overall	0.883**	0.763**	0.883**	0.787**	0.851**	1.000

Significant level**p<0.01

4. Finding

In this study, the underlying conditions and each variable of the 393 valid samples were statistically analyzed using SPSS 26.0 software. The variables of primary states mainly included grade, gender, professional category, and whether they had internship practical training experience.

The distribution of the primary conditions of all samples is shown in Table 4.1. In terms of grade, the number of first-year students in this survey was 139, accounting for 35.4%; the number of sophomores was 142, accounting for 36.1%; and the number of juniors was 112, accounting for 28.5%. Regarding gender, there were 145 male students, accounting for 36.9%, and 248 female students, accounting for 63.1%. From the perspective of professional categories, the number of students in literature, history, and finance is 186, accounting for 47.3%, and the number of students in science, agriculture, and medicine is 207, accounting for 52.7%. From the perspective of internship training experience, the number of people who had internship training

experience was 228, accounting for 58%, and the number of people who did not have internship training experience was 165, accounting for 42%.

Table 4.1 Analysis of the essential characteristics of survey respondents (N=393)

Statistical variables	Category	Frequency	Percentage (%)	Effective rate (%)
Grade	First-year	139	35.4	35.4
	Second-year university student	142	36.1	36.1
	Third-year university student	112	28.5	28.5
Gender	Male	145	36.9	36.9
	Female	248	63.1	63.1
Professional category	Literature, History, and Finance	186	47.3	47.3
	Science, Engineering, Agriculture, and Medicine	207	52.7	52.7
Whether you have internship training experience	Yes	228	58.0	58.0
	No	165	42.0	42.0
Total		393	100.0	100.0

The comparison of the differences in the dimensions of craftsmanship characteristics among students in different grades is shown in Table 4.2 and Figure 4.1. The results show that the samples showed significant differences for all five dimensions, including vocational skills, vocational knowledge, professional ethics, professional attitudes, and professional beliefs. Specifically, in the skill dimension ($p<0.001$), the career skill level of senior students was significantly higher than that of sophomores and juniors. On the career knowledge dimension ($p<0.01$), the senior students performed better than the first and second-year students, while the sophomores' career knowledge was less. The career ethics dimension ($p<0.001$) showed that senior students had the highest career ethics awareness, followed by sophomores, and sophomores had the lowest career ethics awareness. In the dimension of career attitude ($P<0.001$) and career beliefs ($P<0.01$), it still shows that senior students have the highest scores on these two characteristics, while junior students have lower scores. This phenomenon may be attributed to the fact that juniors are in the middle of their senior education phase. At this point, they may lack the same

level of enthusiasm they had during their freshman year and may not yet feel the sense of urgency that comes with approaching graduation. As a result, they may quickly fall into a state of passivity.

Table 4.2 Comparison of differences in the dimensions of craftsmanship characteristics among students in different grades

Dimensionality	Grade	N	M	SD	F	Sig.	Compare Results
Career Skills	First-year	139	3.50	0.81	21.489	0.000***	Third>Frist, Third>Second
	Second-year university student	142	3.58	0.84			
	Third-year university student	112	4.11	0.68			
Career Knowledge	First-year	139	3.57	0.68	5.493	0.004**	Third>Frist, Third>Second
	Second-year university student	142	3.48	0.75			
	Third-year university student	112	3.77	0.69			
Career Ethics	First-year	139	4.14	0.60	14.727	0.000***	Third>Frist>Second
	Second-year university student	142	3.91	0,67			
	Third-year university student	112	4.31	0.45			
Career attitude	First-year	139	4.03	0.60	8.550	0.000***	Frist>Second, Third>Second
	Second-year university student	142	3.79	0.75			
	Third-year university student	112	4.10	0.50			
Professional Belief	First-year	139	4.00	0.65	5.051	0.007**	Frist>Third, Third>Second
	Second-year university student	142	3.85	0.66			
	Third-year university student	112	4.08	0.45			

Significant level*P<0.05, ** P<0.01, *** P<0.001

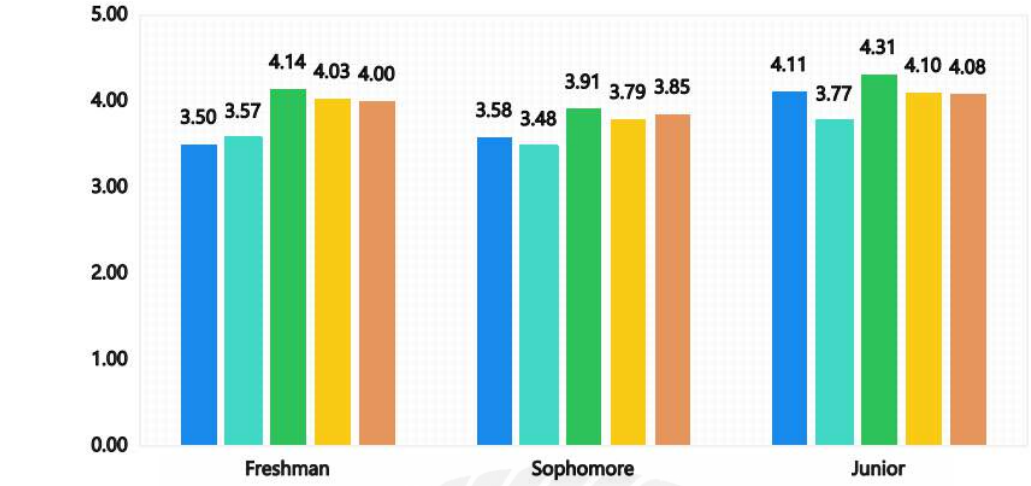

Figure 4.1 Comparison of the differences in the dimensions of the characteristics of craftsmanship among students in different grades

The comparison of the differences between students of different genders in the dimensions of craftsmanship characteristics is shown in Table 4.3. The results indicate that there are no significant differences in the three dimensions of vocational skills, vocational knowledge, and vocational attitudes among students of different genders. In contrast, they offer substantial differences in two sizes of professional ethics ($P<0.001$) and professional beliefs ($P<0.05$), in which the mean values of female students are significantly higher than those of male students, indicating that female students exhibit a higher level of awareness regarding professional ethics and professional beliefs.

Table 4.3 A comparison of the differences in the dimensions of the craftsmanship system among students of different genders

Dimensionality	Gender	N	M	SD	t	Sig.
Career Skills	Male	145	3.73	0.86	0.575	0.566
	Female	248	3.68	0.80		
Career Knowledge	Male	145	3.61	0.79	0.297	0.767
	Female	248	3.59	0.68		
Career Ethics	Male	145	3.95	0.63	-3.924	0.000***
	Female	248	4.20	0.58		
Career attitude	Male	145	3.92	0.66	-1.027	0.305
	Female	248	3.99	0.65		
Professional Belief	Male	145	3.87	0.63	-2.579	0.010*
	Female	248	4.03	0.59		

Significant level*P<0.05, ** P<0.01, *** P<0.001

The comparison of the differences in the dimensions of craftsmanship characteristics among students of different professional categories is shown in Table 4.4. The results show that students of other professional types do not show significant differences in three dimensions of professional skills, professional knowledge, and professional attitude, but show significant differences in two sizes of professional ethics ($p<0.01$) and professional beliefs (<0.05). In these two dimensions, the mean values of students of arts, history, and finance are higher than those of students of science, technology, agriculture, and treatment, which indicates that compared with students of science, technology, agriculture, and medicine, students of arts, history, and finance have a higher awareness of professional ethics and professional beliefs. This suggests that students in the literature, history, and finance fields have a higher level of understanding of professional ethics and professional beliefs compared to students in the science, agriculture, and medicine fields.

Table 4.4 Comparison of the differences between different professional categories in the dimensions of the craftsmanship system

Dimensionality	Professional category	N	M	SD	t	Sig.
Career Skills	Literature, History, and Finance	186	3.66	0.77	-0.999	0.318
	Science, Engineering, Agriculture, and Medicine	207	3.74	0.87		
Career Knowledge	Literature, History, and Finance	186	3.58	0.69	-0.364	0.716
	Science, Engineering, Agriculture, and Medicine	207	3.61	0.75		
Career Ethics	Literature, History, and Finance	186	4.21	0.56	3.203	0.001**
	Science, Engineering, Agriculture, and Medicine	207	4.01	0.64		
Career attitude	Literature, History, and Finance	186	4.00	0.64	1.108	0.268
	Science, Engineering, Agriculture, and Medicine	207	3.93	0.66		
Professional Belief	Literature, History, and Finance	186	4.04	0.61	2.170	0.031*
	Science, Engineering, Agriculture, and Medicine	207	3.91	0.60		

Significant level*P<0.05, ** P<0.01, *** P<0.001

They are comparing the differences in the dimensions of process characteristics between students with and without practical training experience, as shown in Table 4.5. The results show that students with or without practical training experience do not show significant differences in the three dimensions of professional ethics, professional attitude, and professional beliefs. In contrast, they show substantial differences in the dimensions of professional skills (P<0.001) and professional knowledge (P<0.001). In these two dimensions, the mean values of students with practical training experience are higher than those without practical training experience, which indicates that students with this indicate suggests students with internship training experience have better performance in both vocational skills and vocational knowledge, which is also in line with the cultivation objectives of higher education, and undergraduate vocational institutions should strongly encourage and urge students to participate in internship training before graduation to consolidate their professional knowledge and skills.

Table 4.5Comparison of the differences in the dimensions of the craftsmanship system between students with and without practical training experience

Dimensionality	Practical training	N	M	SD	t	Sig.
Career Skills	Yes	228	3.94	0.77	7.171	0.000***
	No	165	3.37	0.79		
Career Knowledge	Yes	228	3.75	0.69	5.368	0.000***
	No	165	3.37	0.70		
Career Ethics	Yes	228	4.12	0.59	0.552	0.581
	No	165	4.09	0.64		
Career attitude	Yes	228	4.01	0.66	1.681	0.094
	No	165	3.90	0.63		
Professional Belief	Yes	228	4.00	0.61	1.282	0.201
	No	165	3.92	0.60		

Significant level*P<0.05, ** P<0.01, *** P<0.001

Based on the research hypothesis, the feedback data obtained from the questionnaire sample survey were analyzed and compared, leading to the following conclusions.

First, there are significant differences in students' perceptions of the cultivation of craftsmanship among different grades and genders. Therefore, we will analyze the reasons and study the corresponding countermeasures to cultivate skilled talents with "craftsmanship" based on the theory of tacit knowledge.

Second, there are significant differences in students' perceptions of craftsmanship among different majors. Therefore, it is necessary to build a collaborative education mechanism and system based on the theory of cooperative education to cultivate skilled talents with "craftsmanship."

Third, Students who have practical training experience demonstrate a higher level of awareness of craftsmanship compared to those without such experience. Therefore, it is crucial to develop a practical talent cultivation program based on the theory of matching human resources with jobs. Additionally, it is important to instill craftsmanship into students' souls, allowing it to become a spirit, an attitude, a belief, and a driving force. By cultivating skilled talents with a "craftsmanship," we can enhance the overall competitiveness of our talents.

5. Conclusion and Recommendation

5.1 Conclusion

This study examines the cultivation of the "craftsmanship spirit" among vocational undergraduate students, using Shandong Engineering Vocational and Technical University as a case study. By controlling independent variables, the dependent variable was identified. A total of 393 valid questionnaires were collected and the sample data was analyzed using SPSS software. The research findings reveal that there are differences in vocational undergraduate students' perception of the craftsmanship spirit. These cognitive differences can be addressed by providing effective methods of nurturing the craftsmanship spirit. Additionally, the study identifies issues in the content, methods, and effects of cultivating the craftsmanship spirit among university students. These issues can be resolved by implementing appropriate teaching reform methods. Furthermore, this study also identified that university students lack proper employment goals. By providing a suitable talent development program, it is possible to foster a correct perspective on employment among students.

First, to provide an effective way to cultivate the craftsmanship. there is indeed a difference in the understanding of the spirit of craftsmanship among students in vocational undergraduate institutions, and the cultivation of the craftsmanship spirit should be integrated into these institutions. The campus environment plays a subtle and influential role in nurturing the spirit of craftsmanship among students in vocational colleges. It can invisibly internalize the excellent qualities of craftsmanship in students' minds, akin to an "invisible hand" in the campus. This serves as fertile ground for cultivating the spirit of craftsmanship, which is crucial. The school employs various methods through the medium of campus culture to cultivate students' craftsmanship spirit. For instance, the school establishes dedicated areas such as professional training venues and extracurricular activity spaces as propaganda zones for promoting the craftsmanship spirit. Platforms such as broadcasting, school newspapers, and other media are utilized to propagate the craftsmanship spirit. The school organizes screenings of films like "The Great Nation of Craftsmen" to further deepen students' understanding of the craftsmanship spirit. Additionally, the school utilizes platforms such as school newspapers, official WeChat accounts, and official blogs to promote the craftsmanship spirit. Various measures, such as organizing professional skills competitions and hosting essay competitions on the craftsmanship

spirit, are taken to foster students' craftsmanship spirit. The infiltration of the craftsmanship spirit within the campus environment has a certain infective power for students. Students can genuinely feel the charm of the craftsmanship spirit within their own campus environment, experiencing its presence firsthand. This permeation effect operates in a subtle and gradual manner, allowing students to naturally acquire the nurturing and influence of the craftsmanship spirit, achieving the effect of "nurturing silently."

Second, to provide suitable teaching reform methods for cultivating the craftsmanship. the cultivation of the spirit of craftsmanship among university students faces various problems in terms of content, approach, and effectiveness. It is necessary to integrate the cultivation of the craftsmanship spirit into vocational undergraduate institutions. It is important to establish a reasonable dual-teacher faculty team and explore new approaches to the development and construction of a dual-teacher faculty team, gradually transforming the talent development goals of colleges and universities towards high-quality and highly skilled artisans, as well as towards skill-based professionals with the spirit of craftsmanship. It is crucial to build a collaborative education mechanism and system, and to cultivate skill-based professionals with the "spirit of craftsmanship".

Third, to provide a suitable talent development program. vocational undergraduate students lack proper employment goals and have a weak sense of consciously practicing the spirit of craftsmanship. Therefore, the cultivation of the craftsmanship spirit should be integrated into vocational undergraduate institutions. From the results of the current situation survey, it can be observed that students without practical training experience perform poorly in terms of vocational skills and knowledge. Thus, vocational colleges must encourage students to participate in professional training, and the main channel for such training is through cooperation between schools and enterprises. Vocational education, due to its focus on "occupation," possesses unique characteristics distinct from other forms of education. School-enterprise cooperation, integration of industry and education, and the combination of industry, academia, and research are important approaches for the deepening and development of vocational education. They are also vital vehicles for cultivating the spirit of craftsmanship among students. Therefore, fostering the spirit of craftsmanship in vocational students must emphasize collaboration with enterprises.

In summary, the cultivation of the spirit of craftsmanship should be integrated into vocational undergraduate institutions, as it plays a positive role in enhancing students' mastery of theoretical knowledge, improving classroom effectiveness, enhancing students' practical skills, developing their ability to solve real-world problems, and increasing their interest in learning. It can provide an effective teaching reference model for future education and enhance the development of high-skilled talents in vocational undergraduate institutions.

5.2 Recommendation

Shandong Engineering Vocational University should integrate the cultivation of the craftsmanship into the entire process of education and teaching, which can greatly promote educational reform.

First, it is recommended to foster the spirit of craftsmanship through a focus on campus culture. We should pay attention to cultivating the spirit of craftsmanship through campus culture. Vocational undergraduate institutions should make full use of campus culture to promote and advocate the spirit of craftsmanship, effectively integrating it into various aspects of students' campus life and learning. Campus culture has a "silent and subtle" effect on the cultivation of the craftsmanship spirit. It is an intangible cultural carrier that contains rich educational elements and is closely related to the learning and lives of all students and teachers. Campus culture with the characteristics of the craftsmanship spirit can subtly inspire students. Vocational colleges should fully utilize campus culture to promote and advocate the spirit of craftsmanship, effectively integrating it into various aspects of students' campus life and learning.

Second, it is recommended to strengthen the construction of a dual-teacher faculty team. It is suggested to establish a unified and standardized mechanism for the qualification recognition and evaluation of dual-teacher educators, clarifying the development direction and pathways for dual-teacher educators. Only by establishing a reasonable structure for the dual-teacher faculty team can satisfactory results be achieved in cultivating the spirit of craftsmanship. The transformation of talent development goals in vocational undergraduate institutions towards high-quality and highly skilled artisans, as well as skill-based professionals with the spirit of craftsmanship, relies on the foundation of a dual-teacher faculty team. Increasing the proportion of dual-teacher educators among the overall faculty is crucial for fostering the spirit of craftsmanship.

There are two sources for dual-teacher educators. One is the direct hiring of full-time teachers with professional practical experience and extensive theoretical knowledge. The other is the appointment of skilled artisans and technical experts from the industry as part-time teachers, who undertake practical teaching tasks. This approach establishes a combined team of full-time and part-time dual-teacher educators, providing a prerequisite for cultivating the spirit of craftsmanship among students.

Third, it is recommended to establish a deeply integrated school-enterprise cooperative education mechanism. By building a deeply integrated school-enterprise cooperative mechanism, vocational students can experience the craftsmanship culture in practical production environments and work scenarios, enhance their identification with the spirit of craftsmanship, and genuinely develop the outstanding qualities of the craftsmanship spirit from within. This will help vocational undergraduate institutions cultivate skilled professionals capable of creating high labor value.

Vocational undergraduate institutions should actively encourage comprehensive participation of enterprises in the talent development process, with the cultivation of excellent craftsmanship-oriented professionals as a common goal. Together with vocational colleges, they can jointly develop talent training programs and form a dual-teacher faculty team to supervise the entire training process. Additionally, establishing excellent skill master workshops in frontline production settings within the enterprise can serve as teaching bases for students to observe and learn. Actively introducing excellent corporate culture for students to study will enable them to experience the attractiveness of workplace culture in the classroom, strengthening the integration of vocational spirit and craftsmanship spirit.

By building a deeply integrated school-enterprise cooperative education mechanism, vocational students can experience the craftsmanship culture in practical production environments and work scenarios, enhance their identification with the spirit of craftsmanship, and genuinely develop the outstanding qualities of the craftsmanship spirit from within. This will contribute to the cultivation of skilled professionals capable of creating high labor value in vocational undergraduate institutions.

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Appendix 1 Questionnaire for cultivating craftsmanship among students of undergraduate vocational institutions

Dear students:

Hello! We are surveying the "Cultivation of craftsmanship among students in undergraduate vocational institutions." The objective of this survey is to gather information about your learning and living conditions in school. The aim is to enhance higher vocational education to better serve social and economic development, and to help every higher vocational student realize their life goals through quality vocational education. We kindly request you take a few minutes to complete the following questionnaire based on your actual experiences. Please be assured that this survey is anonymous, and all results will be used only for statistical analysis. Please feel free to fill out the survey. Thank you for your cooperation and support!

I. Basic personal information

1. What is your year? A. First-year B. Sophomore year C. Junior year
2. What is your gender?
3. What are your major category? A. History and finance B. Science, agriculture, and medicine
4. Have you ever had any practical training experience?

No.	Question	Not at all	Basic non-conformity	Uncertain	Basically conform	Completely Conform
1	I can master the basic operation skills of the professional training equipment					
2	I have a solid professional knowledge base					
3	I have participated in the school's artisanship essays, speeches, and expert lectures					
4	I am good at thinking and studying the problems I do not understand					
5	I will take my job seriously					
6	I will not do dishonest things					
7	I am willing to participate in volunteer activities					
8	I will work hard to achieve my dream in life					
9	I will focus on a job when I forget to eat and sleep					
10	I take everything I do in school and life seriously and responsibly					

11	I have the spirit of initiative, responsibility, and loyalty					
12	I am happy to help each other with my classmates					
13	I often come up with new ideas and put them into practice					
14	Schools have set up practical training places, extracurricular activities, and other craftsmanship promotion areas					
15	The school will use radio, school newspaper, microblog, and other platforms to promote the spirit of craftsmanship					
16	The school will organize us to watch films such as "The Great Artisan" and hold class meetings on cultivating the artisan spirit.					
17	The school offers a career planning course					
18	I think career planning courses are beneficial for students' future careers					
19	Teachers will teach us craftsmanship in the professional courses					
20	Teachers often teach us about "dedication and integrity" in their teaching					
21	The training courses will strictly follow corporate standards and specifications to cultivate students' craftsmanship					
22	The training room will introduce the excellent corporate culture and create a natural professional environment					
23	The school will carry out skills competitions and innovation and entrepreneurship competitions to promote craftsmanship					
24	The school will encourage us to actively apply for professional qualifications related to our field of study					
25	The school will arrange for us to go to a company for an on-the-job internship					
26	The school will introduce enterprise technical experts as instructors of practical training courses					
27	The school will establish a company-related training base to improve our hands-on skills					
28	The school will arrange for us to study the relevant policy documents about craftsmanship					
29	The school will give us a daily code of conduct about craftsmanship					

II. Basic questions (please choose according to your actual situation, only one choice)