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Reform of Craftsmanship Spirit Cultivation Integrated in Automation Major Curriculums

-- A Case of "Automatic Detection Technology" Curriculum

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Abstract: To solve abrupt, superficial and unsystematic problems in the cultivation of craftsmanship spirit in Automation Major Curriculums，the curriculum content and craftsmanship spirit were deeply integrated, taking the curriculum of "Automatic Detection Technology" as an example，it can effectively improve students' professional ability and professional quality. It emphasizes the relationship between the curriculum content and craftsmanship spirit, and integrate the cultivation of craftsmanship spirit into the curriculum teaching in the four dimensions of ideology and morality, will quality, professional skills and thinking quality, and by online and offline blending active and immersivity learning. Practice has proved that deep integration of professional curriculum and craftsmanship spirit cultivation can comprehensively improve students' professional ability, ethics and quality.

Keywords: Cultivation of Craftsmanship Spirit; Curriculum Reform; Blending Learning; Vocational Ability.

1. Introduction

With the increasing development of economy and science and technology in China, the society is in urgent need of a large number of technical and skilled talents. Carrying forward and cultivating "craftsmanship spirit" is a strategic deployment of "China Intelligent Manufacturing" in China. The government has also put forward new requirements for vocational education, Xi Jinping, General Secretary of the CPC Central Committee, has ever stressed that vocational education should strengthen the cultivation of craftsmanship, and cultivate more craftsman with Good moral character, high quality and excellent professional skills. In 2019, the Ministry of Education issued "the Guiding Opinions on the Teaching Management of Higher Vocational Education after the enrollment expansion", and proposed that vocational colleges should strengthen the accumulation of professional quality and technical skills, and integrate professionalism and craftsmanship into the talent training process. The career orientation of automation major in higher vocational education is professional groups such as electrical engineering technicians and automatic control engineering technicians in general equipment manufacturing, electrical machinery and equipment manufacturing. According to the professional teaching standards issued by the Ministry of Education, the craftsmanship spirit of keeping improving, strong employability and sustainable development ability should be cultivated.

Curriculum is the core of vocational education and the main position of cultivating students' ability [1]. In order to improve the effectiveness of the cultivation of craftsmanship spirit in modern vocational education, the craftsmanship spirit must be integrated into curriculum teaching, and also the learning of theoretical knowledge and the cultivation of craftsmanship spirit should be carried out simultaneously.

This paper takes the curriculum of "Automatic Detection Technology" as an example to s research how to cultivate the craftsmanship spirit in the automation major curriculum. It has systematically designed the cultivation dimension, teaching mode and implementation strategy of craftsmanship spirit cultivation. It expanded the direction of curriculum reform of automation major, and also provided reference for the curriculum construction and teaching design of other science and engineering majors.

2. The Current Situation of the Cultivation of Craftsman's Ability in the Curriculum of Automation Major

2.1. The Necessity of Cultivating Students' Craftsmanship Spirit in Higher Vocational Education

The connotation of craftsmanship spirit in the new era includes the working attitude of persisting in concentration and pursuing perfection, the working belief of being more courageous and persistent as the setbacks, the working style of rigorous and meticulous and excellence, and the work pursuit of daring to challenge and pursuing innovation. It is a kind of professional spirit, and the embodiment of professional ethics, professional ability and professional quality [2]. Cultivate students' craftsmanship spirit in higher vocational education, which is the demand for the future career development of higher vocational students, the demand for building a skilled society, the demand for the reform and development of vocational education, and the demand for the survival and development of vocational colleges [3].

Firstly, the cultivation of craftsmanship consider the overall requirements for professional ability, professional ethics and professional quality in professional posts, it can improve students' comprehensive professional ability and employment competitiveness, and can cultivate high-quality technical and skilled talents with the ability of "understanding theory, being

able to operate, being ethical, and being dedicated to their posts" for the front-line production, operation and service of enterprises[3].Secondly, as China's social economy has entered a stage of high-quality development, strict requirements have been put forward for the quality of workers. Integrate the cultivation of craftsmanship spirit into daily teaching, can help build and develop a skill-based society. Thirdly, carry forward the spirit of craftsmanship, which emphasis the training of professional spirit such as advocating labor, loving work, innovation and pragmatism, is the reform direction for the Ministry of Education to deepen the reform of vocational education. Finally, the vocational education organically integrated with the spirit of craftsmanship, which meet the needs of modern enterprises for comprehensive talents with both ability and integrity, can improve the recognition of graduates, and meet the needs of survival and development of higher vocational colleges.

2.2. Problems in the Cultivation of Craftsmanship Spirit in Automation Major Curriculums

With the advancement of ideological and political education in the curriculum, the automation major curriculums have integrated ideological and political education into the teaching, and carried out the cultivation of craftsmanship spirit. However, there are also some problems, mainly in the following three aspects.

First, the cultivation of craftsmanship spirit is superficial, craftmanship spirit is mostly spoon-fed when teaching relevant knowledge points, but not be imperceptibly practiced in the process of specific project implementation. For example, before the curriculum reform, in the curriculum of “Automatic Detection Technology”, When teaching the knowledge of sensor debugging, teacher would remind students to be patient and careful in debugging, but students did not deeply discus and personal experience it through case analysis, frustration education, experience demonstration, etc. So they couldn’t understand why and how to be patient and careful.

Second, the cultivation and integration of craftsmanship spirit is abrupt, ignoring the effectiveness of integration, and even the phenomenon of "two skins". For example, some ideological and political elements are abruptly embedded at the beginning of the class, but they are not related to the knowledge and skills in the class, The spirit of craftsman cannot be organically integrated into the relevant curriculum content like salt dissolving soup，and can't resonate with students.

Third, the cultivation of craftsmanship spirit lacks systematic design. For example, there is no systematic planning to combine the cultivation of craftsmanship with the curriculum content, the ideological and political content is scattered, and the integration method is simplified. The implementation process is unclear, and the practice channel of craftsmanship spirit is relatively limited.

3. Reform of Craftsmanship Spirit Cultivation

This paper combines the teaching of "Automatic Detection Technology" curriculum and the cultivation practice of craftsmanship spirit in recent years, take the curriculum of "Automatic Detection Technology" as an example to research the cultivation of craftsmanship spirit in the automation major curriculum

The curriculum of "Automatic Detection Technology" is a compulsory curriculum for automation major. Its knowledge objectives are to master the professional knowledge of detection system composition and analysis method, automatic detection method and process, sensor principle and signal analysis, sensor characteristics and selection, sensor use and maintenance, detection data analysis and error processing. Its capability objectives are to build the vocational ability to build detection systems according to customer needs, use sensors to accurately detect the measured, and debug and maintain the detection system. Its quality objectives are to cultivate the craftsmanship spirit of excellence, preciseness and meticulousness, unity and cooperation, integrity and innovation.

The curriculum meets the talent training needs of automation major for craftsmanship spirit, relies on the Zhejiang Institutions of Higher Learning Online Open Course Sharing Platform, take “precise design - precise detection - elaborate development - lean pragmatism - precise debugging” as the main line of craftsman's spirit. It deeply integrates with craftsman quality, and cultivate craftsmen who can accurately analyze customer needs, carefully develop the detection system, skillfully use sensors to accurately detect the measured, accurately debug the system performance, and lean to help enterprises reduce costs and increase efficiency.

3.1. Cultivate Craftsmanship Spirit Through Four Dimensions

In order to overcome the lack of systematic design for the cultivation of craftsmanship spirit, and based on the connotation of craftsmanship spirit, the curriculum combine the relationship between the teaching content, teaching situation and craftsmanship spirit, and cultivate craftsmanship spirit from the four dimensions of ideology and morality, will quality, professional skills and thinking quality.

Ideology and morality are the power source of craftsmanship spirit, so ideological and moral education is the starting of cultivating craftsmanship spirit [5]. Based on moral education, and make craftsmanship spirit play a leading role in professional value, the curriculum cultivates students' sense of identity, responsibility, honor and mission for craftsmanship, and enhance the internal motivation of learning. Relies on the craftsmanship spirit education base in the second and third classes, the secretary of the branch, the party building alliance, the national model workers, and the outstanding senior students are invited to carry out lectures and debates, so as to enable students to learn from the people and things around them, guide students to establish lofty ideals, and cultivate the moral concept of serving the people and contributing to the society.

Will quality be a useful tool for craftsmen to maintain their spirit. The curriculum organically combines the craftsmanship spirit with the Marxist labor concept, and deeply integrate with the brief of “All roads lead to Rome” and “Labor is the most glorious”. It enables students to hone their will, perseverance and endurance, and develop superb skills and craftsmanship quality in the curriculum study. Model workers are invited to carry out a series of lectures on “labor is the source of happiness”, and students are invited to feel the craftsman quality of hardworking and dedicated at a close distance. On-duty students are arranged to tidy the classroom, maintain the equipment and training order. Evaluation mechanism is introduced to encourage students to

love work and be loyal to their duties.

Professional skills are the foundation of a craftsman, and also the full display of the craftsman's spirit of dedication and excellence. Focused on the ability requirements of professional posts, and based on real projects of enterprises, the curriculum emphasis skill training, technology application and project implementation. Take the teaching project of "Service Robot Motion Parameter Detection" as an example, according to the progressive cognitive law, taking the engineering project development process of “overall design - functional realization - system joint commissioning” as the main learning line, five advanced learning tasks are designed, and students are enabled to experience the employment atmosphere, practice the work content and exercise professional skills.

Thinking quality is the original power of craftsmen to continuously optimize and improve the quality of products, and innovation is the only way for enterprises to maintain long-term vitality. The curriculum aims to cultivate the ability to build measurement and control system, according to the requirements of X certificate for sensor network application development, and relies on state-level maker space and advanced manufacturing industry and education alliance. It realizes the integration of “Post, Curriculum, Competition and Certificate” through teachers' scientific research and technological innovation projects, student entrepreneurship projects, competition and certificate training, interest and entrepreneurship associations, etc, so as to improve students' creative awareness, innovative spirit and entrepreneurial ability.

3.2. Adopt Online and Offline Blending Active Learning Mode

American educator and psychologist Bloom has ever divided the educational objectives into six levels in the cognitive field: memorization, understanding, application, analysis, evaluation and creation [6]. It’s’ the learning process from the initial understanding to the advanced internalization and creation. At each stage of learning, students' positive learning attitude should be emphasized, active participation, willingness to explore, and diligence can effectively achieve educational objectives. The learning efficiency pyramid of the National Training and Training Room of the United States also points out that the efficiency of active learning methods such as group discussion, practical exercise and teaching others is significantly better than that of passive learning methods such as listening and reading.

In view of this, in order to solve the superficial problem of craftsmanship spirt cultivation, we should give full consideration to learning content, learning time, cognitive rules and learning methods. We should transform the subject of learning from teachers to students, transform the focus of knowledge theory learning from teaching in-class to self-study off-class, transform learning time and space from classroom pure offline to pre-class, in-class, post-class, online and offline. Students are enabled to efficiently and deeply study and solve problems in class, and teachers are enabled to teach students according to their aptitude in class. In the process of online independent inquiry before class, students independently learn and collect the craftsmanship spirit ideological and political content related to knowledge and skills, and remember and understand its connotation. In the process of online and offline discussion, practical training and project evaluation in class, students immersively experience the essence of craftsmanship spirit, internalize the recognition of craftsmanship spirit and shape craftsman quality. In the process of online and offline consolidation and extension after class, students further deepen the practice of craftsmanship spirit, strengthen the pursuit of craftsmanship spirit, and externalize it into conscious actions of craftsmanship spirit.

3.3. Focus on Content Relevance and Adopt Immersively Experience Strategy

In order to overcome the abrupt problem of craftsman cultivation, we should pay attention to the connection between the teaching content and the ideological and political elements that are integrated, and the integration of craftsmanship spirit should be based on immersive experience. The inspirational stories of craftsmen in the industry are embedded in the learning materials before class, which tell about how to use professional knowledge and skills to overcome difficulties, make outstanding contributions to enterprises, industries and countries, and inspire students to respect the spirit of craftsmanship. Students are required to independently collect ideological and political causes related to the learning task of this class, and carry out speculation in the discussion area of the online course to explore the connotation and significance of craftsmanship spirit. Excellent works or “negative teaching materials” are introduced into class, so as to arouse students' internal motivation to learn well the classroom content in a spirit of excellence. Through the standard system and process evaluation, students are required to do a good job in sensor performance experiment. By the teaching activity of “correcting errors and training operations,” the rigorous and meticulous work style is emphasized, which also lays the foundation for the subsequent sensor application. By the cooperation of senior tutors, enterprise tutors and model workers, the work pursuit of courage to challenge and innovation is firmly adhering. By the combination of pre-class diagnostic evaluation, in-class process evaluation and after-class summary evaluation, the enterprise tutor is invited to evaluate in combination with the enterprise standards and conduct targeted education according to the evaluation feedback, so as to further improve the enterprise's recognition of students' professional quality.

4. Learning Effect of Cultivating Craftsmanship Spirit

Integrate the cultivation of craftsmanship spirit into professional curriculums, and urge students to be strict with themselves according to the standards of great craftsman in their study, students has firmly mastered professional knowledge and skills, and imperceptibly shaped the spirit of dedication, focus, lean and innovative craftsman.

In terms of knowledge and skills, students have mastered common sensor symbols and objects, they can consult sensor manuals and industry standards with tools, they have a solid grasp of sensor selection, installation, signal analysis, commissioning and maintenance, they are skilled in the analysis and design of the detection system. Two automation major classes with the same source of students and the same professional basis were selected for comparative experiments. As the control group, the students of Class Automation 2002 adopted traditional teaching methods. As an experimental group, the students of Class Automation 2003 integrate the cultivation of craftsmanship spirit into the curriculum. The

two classes adopt the same assessment method, it was found that the pass rate of the experimental group was 100%, which was better than 91.1% of the control group. The good rate of the experimental group was 76.1%, which was better than 55.8% of the control group. The excellent rate of the experimental group was 19.6%, better than 11.6% of the control group.

In terms of professional quality, students' self-identity and professional identity are significantly enhanced. Compared with the control group, the classroom participation of the experimental group was 100%, better than 69.7% of the control group. The class task completion rate of the experimental group was 95.6%, which was better than 79.1% of the control group. The timely completion rate of homework in the experimental group was 91.3%, which was better than 83.7% in the control group. After systematically integrating craftsmanship spirit into the curriculum, the students have established a correct craftsman's morality and labor concept of “serving the people” and “ All roads lead to Rome,” they have deeply developed the will to be hardworking and meticulous, and they have shaped the professionalism of excellence and the thinking quality of collaborative innovation.

5. Conclusion

From the four dimensions of ideology and morality, will quality, professional skills, and thinking quality, cultivate craftsmanship spirit in major curriculums, which guide students to form excellent qualities of dedication, excellence, and innovation, is helpful to comprehensively improve students' professional ability, professional ethics and professional quality. In the online and offline blending learning mode, students actively immerse in the essence of craftsmanship spirit, which can internalize the recognition of craftsmanship spirit and shape craftsman quality.

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