Research on the Best Teaching Mode of Non-Destructive Testing Major in Higher Vocational Education

Yuguo Yue

Liaoning Mechatronics College, Liaoning, Dandong, 118000, China

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Abstract: This paper expounds and analyzes four typical teaching modes and their characteristics in contemporary higher vocational education, which are "regional school-enterprise linkage development of industry-university-research integration", "working-school-industry-enterprise cooperation", "modern apprenticeship", and "result-oriented demonstration of the Sydney Agreement". Give an example and analyze the current status of NDT education in China: NDT technology covers the breadth of science and technology, the importance of NDT in higher vocational education, and there are large differences between vocational colleges and regions in China Sex. Finally, on the basis of theoretical analysis and summary of practice, the appropriate and best educational teaching model for non-destructive testing in higher vocational education is discussed and studied.

1. Introduction

In the early 1970s, American teacher education experts Joyce and Weir conducted ground breaking research on the teaching model. On the basis of thorough research, they published the book "Teaching Model" in 1972 and gave the teaching model is defined: it is a plan or paradigm that constitutes a course (a long-term study course), selects textbooks, and guides teaching activities in classrooms and other environments. Since then, people began to continue to explore teaching models, but so far, no consensus has been reached. On the basis of summarizing the opinions of many experts and scholars, people generally believe that the teaching model of higher vocational education usually refers to: under the guidance of certain vocational education ideas or theories, in order to complete specific teaching goals and contents, it is established according to the teaching conditions and environment The relatively stable teaching activity structure framework and activity procedures. It generally includes 6 elements: basic educational concepts, teaching objectives, teaching conditions, teaching procedures, teacher-student mix and teaching evaluation.

2. Types of Education and Teaching Models

In recent years, the teaching of higher vocational education in China has been in full swing, and various vocational colleges have achieved many successful experiences in adopting and innovating the teaching mode of education. At present, there are the following hot models.

The joint development of district schools and enterprises the mode of running schools combining industry, education and research. The school-industry-research mode refers to the organic integration of production, education, scientific research and other activities in the form of industry-university-research interaction and school-enterprise cooperation, linking teacher participation in enterprise problem research and classroom teaching with students' participation in practical activities. Help colleges and universities play an active role in promoting regional industrial development and providing high-quality human resources and intellectual support for enterprises. The combination of production, teaching and research is of great significance to the promotion of regional economic and social development and the strength of higher education institutions themselves. The intrinsic requirement to realize the three major functions of talent training, scientific research and social services in colleges and universities is the combination of industry,

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university and research, which generally refers to the process of organic integration and coordinated development of universities, production units and scientific research institutions. The reason is that the development of colleges and universities should face the market, the main battlefield of economic construction and social progress. Industry-university-research cooperation refers to the cooperation between enterprises, research institutes and colleges and universities, usually refers to the cooperation between the enterprise as the technology demand side and the research institute or higher school as the technology supplier, and its essence is to promote technological innovation. An effective combination of various production factors is required. “Industry” in industry-university-research cooperation refers to modern enterprises and modern entrepreneurs relying on technological innovation in industry and various industries; “learning” generally refers to academia; “research” mainly refers to conducting basic research, applied research and various Application-oriented research institutes centered on the development of similar technologies and scientific research institutions in universities. In China, “production, education and research cooperation” generally refers to the cooperation between universities, scientific research institutions and industry. Liaoning Vocational College of Mechanical and Electrical Technology took the lead in setting up the “instrumentation and instrumentation industry” production and education group in Liaoning, Jilin, Heilongjiang, Inner Mongolia and parts of Hebei, and the effect is very obvious.

Work-study integration School-enterprise cooperation model. The combination of work and study is an education model that combines learning and work. The main subjects include students, enterprises, and schools. It is career-oriented, makes full use of the different educational environments and resources inside and outside the school, and organically combines school education with classroom teaching as the mainstay and direct access to actual experience to work outside the school, throughout the training process of students. In this process, students participate in various learning activities with theoretical knowledge as the main content in the school as the educated, according to the requirements of professional teaching, and participate as a “professional” outside the school according to market demand. Practical work related to the study major. The main purpose of this education model is to improve students' comprehensive quality and employment competitiveness, and at the same time to improve the adaptability of school education to social needs. For the education model that combines learning and work, each country has some customary terms. For example, the United States calls it “cooperative education” or “combination with work”, the UK calls it “sandwich education”, and our country It is called “combination of work and study” or “half work and half study”, which is realized in the form of “factory-college, school-factory”.

Modern apprenticeship model. The modern apprenticeship is a project proposed by the Ministry of Education of the People ’s Republic of China in 2014 to deepen the integration of industry and education, school-enterprise cooperation, further improve the school-enterprise cooperation education mechanism, and innovate the technical and talent training model. The modern apprenticeship is a modern talent training model that focuses on skill training for students through in-depth cooperation between schools and enterprises and joint teaching by teachers and teachers. Different from the talent training mode of ordinary college classes and previous order classes and title classes, modern apprenticeship pays more attention to the inheritance of skills. Schools and enterprises jointly lead the cultivation of talents, and the establishment of standardized corporate curriculum standards and assessment programs reflects the school and enterprise. Deep integration of cooperation. The modern apprenticeship system is conducive to promoting the whole process of training talents in industries, enterprises and vocational education, achieving the connection between professional settings and industrial needs, the connection between course content and vocational standards, the connection between the teaching process and the production process, the connection between graduation certificates and vocational qualification certificates, vocational education and Lifelong learning and docking to improve the quality and pertinence of talent training. The deepening of the combination of work and study and the further development of the talent training model of school-enterprise cooperation is the core content of the modern apprenticeship pilot. The non-destructive testing major can be said to be the most suitable for developing a modern apprenticeship talent training model. Higher vocational colleges and cooperative enterprises should

jointly develop talent training programs, develop courses and textbooks, and design based on the growth of technical skills and the actual needs of jobs. Implement teaching, organize assessment and evaluation, and carry out teaching research. Schools and enterprises should sign a cooperation agreement, and higher vocational colleges undertake systematic professional knowledge learning and skills training; enterprises carry out post-skill training in the form of masters and apprentices, according to the training plan, and truly realize the integration of schools and enterprises.

The demonstration model of the outcome-oriented “Sydney Agreement”. Under the influence of China's participation in the “Washington Agreement” and the undertaking of professional certification in engineering education in a number of undergraduate colleges, a number of vocational colleges and universities have a great interest in the “Sydney Agreement” related to them, and refer to the “Sydney Agreement” paradigm for professional construction Research and practice. The “Sydney Agreement” is aimed at the training of engineering and technical experts, which is close to the training objectives of China's vocational colleges. Achievement-oriented education is the most important guiding principle for curriculum development in the Sydney Agreement. Achievement-oriented curriculum development adopts the principle of “reverse design” and carries out instructional design based on “learning results” to promote school curriculum reform. The “Sydney Agreement” does not provide a method for curriculum reform. It believes that applicants have freedom in curriculum design and development. In the process of introducing the “Sydney Agreement”, some higher vocational colleges used the practices of Taiwan's educational institutions in Taiwan to make curriculum reforms based on the “core competence” that reflects competence elements and the “ability index” that reflects competence performance. These vocational colleges follow the general view of professional competence and believe that those who perform well at work have some common personality traits, which can be transferred to all work situations. The disadvantage of the general view of professional competence lies in its “de-situationalization”. It is believed that competence is knowledge, skills, and attitudes that are independent of specific job situations. This not only violates the theory of multiple intelligences, but there is no empirical research that finds that general competence does exist. A key task of achievement-oriented curriculum development is to assign weights to ability indicators. The method mainly uses the practice expert survey method and the teacher's brainstorming method. Seemingly adopting a rigorous scientific method, it is actually a subjective assumption of de-contextualization. It does not take into account the close connection between a person's general personality characteristics and related professional situations, and cannot reflect the overall requirements of professional practice. At the same time, the “structured” and “fixed” assignments to the curriculum ability indicators will inevitably affect the openness of the curriculum, and will also bring limitations to the development of abilities, which is not conducive to the development of students' critical thinking and innovative thinking. The development of human professional ability is not an abstract process, it requires a specific learning environment. Through the construction of model colleges and backbone colleges, China's higher vocational colleges have carried out a lot of practice and gained a lot of experience in the systematic course of work process. It has become a basic consensus and stereotype to determine the professional positioning according to professional needs and develop courses based on job analysis. Work process-oriented curriculum development combines vocational qualification research, personal career development goal design, curriculum design with teaching analysis and teaching design, and to a large extent achieves the “result-oriented” effect.

Therefore, the results-oriented curriculum reform of the “Sydney Agreement” should be reviewed on the basis of the exploration and practice of vocational curriculum reform in China. Taking a cautious and sensible attitude, on the basis of rich practice, gather the best of hundreds to create their own “discourse system”, form a Chinese model and Chinese experience, and make unique contributions to higher vocational education in the world.

The above four models can be said to have their own merits. They are the mainstream models of higher vocational colleges. They have inevitable connections and sharp differences. For example, the modern apprenticeship is a further extension of the combination of work and learning and school-enterprise cooperation. So what is the best mode of non-destructive testing in higher

vocational education and teaching?

3. What is the Best Mode of Non-Destructive Testing in the Teaching of Higher Vocational Education?

Although we have good reasons to ask this question, there may not be a good answer. The specific reasons are as follows:

Non-destructive testing technology covers a wide range of science and technology. It can be said that the field of non-destructive testing technology is all-inclusive, including sound, light, heat, electricity, magnetism, etc. It involves physics, chemistry, materials, machinery, electronic technology, measurement technology, information technology, computer technology Multi-faceted content. At present, nondestructive testing is divided according to the physical principles of its application, mainly including the following technologies:

Mainly based on electromagnetics: magnetic particle testing, eddy current testing and magnetic memory testing.

Mainly based on electromagnetic waves: ray detection, X-ray real-time imaging technology, computer ray detection technology (CR) and digital ray detection technology (DR), microwave detection technology, laser holographic detection technology, etc.

Mainly based on mechanical waves: ultrasonic detection, acoustic emission (AE) detection, ultrasonic diffraction time difference method (TOFD) and ultrasonic phased array technology.

Mainly based on infrared and thermal: infrared non-destructive testing technology and thermal imaging non-destructive testing technology magnetic memory testing.

Mainly based on vibration: knocking nondestructive testing technology and acoustic vibration nondestructive testing technology.

Other non-destructive testing technologies mainly include: penetration testing, leak testing and endoscopy testing.

Non-destructive testing is very important in higher vocational education. As we all know, higher vocational education plays an important role in China's education and teaching system. Similarly, NDT is no exception. A major philosophy of higher vocational education is based on the principle that theory is sufficient, highlighting practical skills, so that it will work and know why it should be done like this. At the same time, graduates of higher vocational colleges can achieve a seamless link with employment, which is not available in other education and teaching systems. Therefore, the higher vocational education of non-destructive testing is very, very important.

There are large differences between various vocational colleges and regions. At present, there are more than 30 vocational colleges offering non-destructive testing majors nationwide. The differences between various schools are mainly in the following three aspects:

Differences in industry direction. Non-destructive testing majors in higher vocational colleges have different backgrounds in the direction of running schools. For example: the aviation industry includes Nanchang and Changsha Aviation Technical College; the military industry includes Qingdao Naval Engineering Vocational Technology College; transportation The direction is Liaoning Rail Transit Vocational Technical College, Huludao Shipbuilding Vocational Technical College, Tianjin Maritime Vocational Technical College, etc .; the engineering industry direction is Changzhou Engineering Vocational Technical College, etc .; the petrochemical industry direction is Lanzhou Petrochemical Vocational Technical College, etc .; labor industry The direction includes Changsha and Kunming Labor Vocational Technical College; the manufacturing industry includes Liaoning Equipment Manufacturing Vocational Technical College; the comprehensive industry includes Shenzhen, Zhongshan Vocational Technical College and Liaoning Mechanical and Electrical Vocational Technical College.

Differences in teaching conditions and environment. The main problems in this area are reflected in projects such as training resources, teaching equipment, and space area. Some vocational colleges, due to lack of funds, limited investment, less equipment and incomplete facilities, etc.

Differences in regional geographic location. In China, it is self-evident that the differences between the geographical location, regional economy, and business philosophy of the North and the

South are self-evident. In general, the South is stronger than the North.

It is these major differences that have caused differences in the education and teaching objectives, school philosophy, and school mode of non-destructive testing majors in higher vocational colleges in China. Especially in terms of school mode, what is the best? This question is what our higher vocational non-destructive testing education and teaching workers should think about most!

4. Conclusion

To sum up, in any vocational college, the form of running a school cannot be rigid. It must be flexible and changeable. Only a variety of forms of running a school can win a broad market development space and develop comprehensive and high-level production with enterprises. Only the combination of study and research in higher vocational education can form a talent-training mechanism for interaction between colleges and enterprises, and in order to gain vigor and vitality for higher vocational education to enter a virtuous circle and sustainable development.

The best non-destructive testing model for higher vocational education should be based on the college ’s orientation in running schools, and determine the development direction of non-destructive testing in combination with the college ’s development planning, industry characteristics, and geographical advantages. The majors are derived from other majors and serve other majors, but from the perspective of the professional system, they are independent from other majors. They have their own main positions and should have a complete talent training program and specific graduate quality requirements. In higher vocational colleges, non-destructive testing majors should focus on personnel training objectives, analyze typical work tasks, determine areas of action, build a talent training model, curriculum system, and adopt an optimal educational teaching model, such as: modern apprenticeship, and It is suitable for scientific assessment and evaluation methods with characteristics of higher vocational education, and cultivates qualified non-destructive testing graduates of higher vocational education.

Finally, I would like to make a personal point of view. In different regions of China, non-destructive testing technology vocational colleges should be merged to carry out resource sharing, complementary advantages, and “Belt and Road” education and teaching.

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