

Construction of the Curriculum System of "3+4" Connection between the Secondary and Higher Vocational Education in the Application-oriented Undergraduate Colleges

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Abstract—Construction of the curriculum system between the secondary and higher vocational education is an important component of modern vocational education. Taking the construction of the curriculum system of "3+4" in the major of Mechanical Manufacturing and Automation in Jilin engineering normal university as an example, and giving full consideration to the need of economic construction of Jilin province and machinery industry development, we research and discuss the curriculum system construction of the secondary vocational schools and universities in this paper. It explores a better path for promoting the implementation of the strategy of developing higher education and the sound development of vocational education in Jilin Province

Keywords—application-oriented undergraduate colleges; connection between the secondary and higher vocational education; curriculum system

I. INTRODUCTION

In 2014, the Education Department of Jilin Province issued the "Notice on Printing and Distributing the Implementation Plan for the Implementation of the Pilot Project of Higher Vocational Education Linking" and the Measures for the Administration of the Pilot Management of Higher Vocational Education in Jilin Province (Trial). As the first batch of application of undergraduate transformation pilot unit Jilin Province, the and the director unit of undergraduate colleges and universities in the transformation of the development of the development union in Jilin Province, our university work with more than 20 secondary schools in Jilin Province, engaging in the "2 +3", "3 +4", "3 +2" and other training work of cohesive mode. In this context, this paper taking as an example "3 +4" (3 years of secondary vocational education, 4 years undergraduate education) bridging curriculum system construction of our mechanical design manufacture and automation major to explore how to bridge successfully on the basis of the original education levels, so as to achieve the goal to cultivate applied talents in high-quality. Based on argumentation of the two bridging schools, the consultation of school representatives, businesses and industry experts, this

paper put forward the curriculum system construction principles and curriculum framework, and is attempted to conduct in - depth research in the vocational - undergraduate curriculum system integration design. The construction principles of curriculum system and curriculum framework are put forward in this paper.

II. THE NECESSITY FOR BRIDGING COURSES

There has been an awkward situation -- "one leg long, one leg short" in China's general education and vocational education for a long time. Vocational education was once considered as "education of poor students and needy students" with lower social recognition and lower quality students. Meanwhile, the traditional vocational education model limited the students' potential in an early stage, leading most students "into the vocational school for life" situation. With low possibility to pursue higher education, it did not form a complete education system vertically. In foreign countries, especially in European countries, general education and vocational education are two parallel education categories, with a complete system including vertical development. It's common that Vocational school students can continue to enter the specialist and undergraduate colleges for further study, even pursuing master or Ph.D. degree, enabling the vocational education more recognizable in public, which has always been the backbone of national entity economy.

Amid the rapid development of China's economy, the industrial structural adjustment picked up pace, technology kept advancing, The demand for high-end technical personnel is increasing, and the personnel training is inseparable from the joint efforts of secondary and higher vocational education. In June 2014, the State Council arranged six ministries and commissions to compile the "The modern occupation education system construction planning (2014-2020)". It aimed to forge a modern vocational education system that meets the need of development, realize the combination of vocational education and industry, and the bridging between secondary and higher vocational education, set up the communication links between vocational education and general education. The system is also

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expected to reflect the concept of lifelong education, with Chinese characteristics and the world standard. In order to achieve this goal, it is crucial to achieve the effective bridging and coordinate development between secondary and higher vocational courses, vocational and applied undergraduate curriculum system [1].

III. THE PROBLEMS IN THE CONSTRUCTION OF THE CURRICULUM SYSTEM OF THE BRIDGING EDUCATION IN HIGHER VOCATIONAL EDUCATION AND THE ANALYSIS

A. The Problems in the Construction of the Curriculum System

1) Cultural basic course

Due to clear professions (or professional orientations) and jobs in vocational schools, professional basic courses and skills training take up much of students' time, while the cultural basic courses such as mathematics, Chinese, foreign language, etc. are less than those of ordinary high school, with curriculum content and depth much poorer. Apart from that, the students are generally with low entrance scores and poor self-learning ability. If vocational schools follow the original curriculum system, their students will find great gap with students graduated from high schools when entering the undergraduate stage. If undergraduate schools teach according to the original requirements of teaching, many problems will ensue. How to ensure that the basic course of vocational education can meet the requirements of the follow-up course of the undergraduate course, and go with the integration designing of cultural basic courses? That's one of the problems in the curriculum system bridging of secondary and higher vocational educations

2) Professional curriculum system

a) Theoretical curriculum system

Students in secondary vocational schools have begun study some professional foundation courses, of which the quantity and contents depth and range are inferior to that of undergraduate courses, besides, these two courses of different levels have something overlapped. All these pose great challenge to courses bridging. How to carry out the integration design of professional theory curriculum system is another challenge towards the bridging curriculum system.

b) Practical curriculum system

In recent years, in response to the basic state policy of developing energetically the vocational education, country's investment in vocational schools has improved a lot. With the establishing of national- or provincial-level demonstration school, some practice instructors have more opportunities to go abroad and continue professional development. Particularly, the national skill competitions, such as CNC skills competition, have greatly improved teacher's practical skills and great changes have been made in the school internship training equipment, which are even better than those of colleges and universities. However, in other practical aspects, such as the comprehensive designing experiments, curriculum designing and graduation design that require solid theoretical basis, curriculum design and graduation design and other content, vocational students may face big problems. It is also the main issues of curriculum system bridging in vocational education

that how to take full advantages of skills training in above areas in vocational school, and design ability and the ability to apply the knowledge to solve problems which are uniquely developed in undergraduate schools.

B. Solutions

In conclusion, the curriculum system designing of the courses bridging is not the mechanical superposition of vocational and undergraduate courses. Colleges and universities must get out of the discipline education system. Vocational schools should not follow the original vocational education model, only then can they carry out integrated design with colleges and universities. The integrated design should be the vocational education model based on the skills training. On the basis of industrial bridging, task orientation, convergence, collaborative development, it promotes the integration of curriculum standards and vocational standards, and the bridging of academic certificates and professional standards. At the same time, the bridging education curriculum content will depend on the task requirements, and the training objectives are subject to the students' career development approach. The characteristics of vocational education should be highlighted to build a capacity-based professional curriculum system with the main line of professional practice and major body of the project curriculum. Besides, we should respect the growth technical skills talents and the cognitive characteristics of students so as to design the overall personnel training programs and promote the higher vocational education curriculum bridging. [2].

IV. THE CONSTRUCTION OF "3 + 4" BRIDGING CURRICULUM SYSTEM FOR VOCATIONAL EDUCATION IN APPLIED UNDERGRADUATE COLLEGES

Mechanical design manufacture and automation major is the national characteristic discipline in our school. We have been carrying continuous enrollment in 38 years since the establishment of our school, with a wealth of undergraduate talent training experience. Since 2014, the number of students enrolled from the whole Jilin province has reached 200, all in vocational school- application undergraduate "3 + 4" projects. On the basis of the full research in mechanical design and manufacturing and automation, relying on local machinery manufacturing industry, mainly the auto parts manufacturing industry, we target the training objectives at high-quality CNC processing technology skills training. In accordance with the design concept--the seven-year pattern, we implement the training of technical skills in phases. The vocational school- application undergraduate "3 + 4" curriculum system is set in line with vocational skills standards, industry standards and curriculum system bridging ideas.

A. Teaching objectives

1) Teaching objectives in the vocational stage

To develop students with good professional quality, sound mind and body. To impart them the basic and professional knowledge of mechanical design and manufacturing and automation major, turning them into high-quality workers and intermediate skilled talents that equipped with professional skills of intermediate NC operator, CNC programmer and CNC technician.

2) *Teaching objectives in undergraduate stage*

Focus on the need for Jilin economic development. Take as the main line the cultivation of technical design capabilities and CNC machine operating skills. Facing the mechanical processing and manufacturing industry, to help students understand the corporate culture, develop good professional quality and physical and mental health. In addition, students are expected to master the basic knowledge, skills and application methods of mechanical design and manufacturing and automation, and possess professional dedication spirit and innovative quality. It is hoped that they can work in the NC process design, CNC machining programming, operate CNC machine tools and manage the running of machinery industry. To turn themselves into high-level technical and technical talents with the quality of "CNC technician + CNC technician".

B. *Course system to build the basic principles*

(1) The principle of subject diversity. The personnel training program developing is conducted with the participation of enterprise industry, vocational colleges, colleges and universities. To study and formulate jointly the personnel training programs, develop professional core courses and compile textbooks. Efforts should be made jointly in the preparation of teaching teams, and the building of a employment platform to realize the common development of all parties. In the process of "3 +4" vocational - undergraduate talent training program development, we have made in-depth investigation and research in some 20 companies including Jilin Universal General Machinery Co., Ltd., and discussions with teachers from vocational schools that would initiate bridging projects, such as Changchun Machinery Industry School and Jilin Vocational and institute of technology. The vocational and undergraduate course system was set jointly after many amendments.

(2) To cultivate the principle of consistency of standard. In the process of personnel training program development, through discussions and researches in several dimensions, the main line of personnel training should be clarified. To ensure that the technical personnel in CNC technology represent as the main line aimed the vocational and undergraduate personnel training program, and to maintain the consistency in the training program of vocational and undergraduate students.

(3) Cultural basic class "accessible and applicable" principle. When increasing the cultural basic course in vocational stage, vocational schools should be equipped with teachers possessing teaching ability and strong sense of responsibility. In undergraduate stage, the school need to cut the teaching content in advanced mathematics, engineering mathematics, general physics and other cultural basis courses in accordance with the teaching content of professional courses. Foreign language courses should be delivered according to vocational requirements. The cultural basic course textbooks in seven-year pattern should be compiled in "accessible and applicable" principle.

(4) The non-stop core course of the principle. The core curriculum of the talent training program should begin with fundamental level, with the difficulty escalating gradually. The theory will go deep in the undergraduate stage, stressing the non-stop core course of the principle. For example, electrical and electronic technology 1 (vocational), mechanical design basis 1 (vocational) and Two-dimensional computer graphics (vocational) are given in vocational stage, and electrical and electronic technology 2 (undergraduate), mechanical design basis 2 (undergraduate) and three-dimensional computer graphics (undergraduate) in undergraduate stage. Through the integration of curriculum content, it not only avoids the duplication of knowledge, but also ensures continuity in core courses and promotion of theoretical depth. In order to make the course content effective and seamlessly bridged, regardless of the vocational or undergraduate stage, it is imperative to the teach basic theoretical courses, professional courses with project curriculum as the main body and the production process in industry as the main line. By doing so, to fill the transition from the subject system to vocational education system in undergraduate stage.

(5) The core skills escalating principle. The core skills of personnel training program need to reflect the principle that primary, intermediate, advanced and technician quality are enhanced step by step. Primary and secondary core skills are cultivated in intermediate phase, while advanced, technician quality skills are trained in undergraduate stage. When it comes to the CNC training, the car, milling skills training that equivalent to intermediate workers level will be given in the vocational stage, while that of senior workers level will be given in the undergraduate stage. Moreover, a small number of students showing strong capability will begin the technicians' quality training, which reflects the consistency in training specifications and the gradual improvement of core skills.

(6) Employment-oriented principle. The personnel training is serve to the enterprises transformation and upgrading and local economic development. The training curriculum set must depends on the needs of enterprises, and personnel training should be targeted, so that talents can be geared effectively to the needs of the job. To this end, the "double-teacher" courses delivered jointly by the enterprise teachers and school teachers were set in the undergraduate training program. To make the students more suitable for business needs, the rate of practical project as curriculum design, graduation design should not be less than 30%, students must take part in corporation practice for at least 18 weeks.

V. CURRICULUM FRAMEWORK

The main framework of the bridging course consists of two basic parts, namely basic quality of bridging professions and core competence training, which are described from the vocational (Fig.1) and undergraduate (Fig. 2) level respectively.

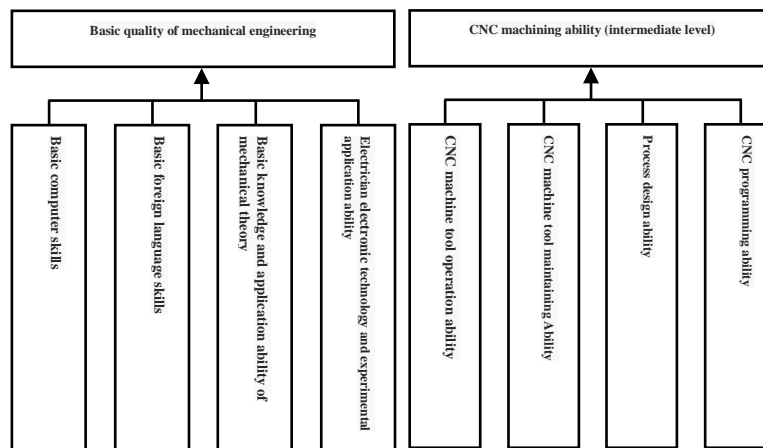


Fig. 1. The curriculum framework of the vocational school

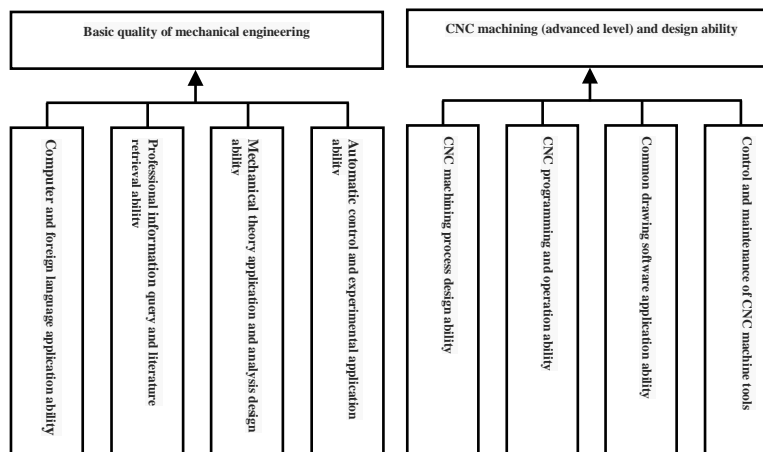


Fig. 2. The curriculum framework of the undergraduate school

VI. CONCLUSION

The curriculum connection of vocational colleges and application-oriented colleges is the key and foothold of the connection of the two stages. The connection of vocational and undergraduate colleges is in fact the carry-on and division of the courses of the two schools. The curriculum framework of our school's "3+4" connection in the major of Mechanical Manufacturing and Automation has set up a "bridge" for vocational and undergraduate education. It is the effective reform of talent training mode innovation under the background of transformation development, aiming to provide references for the curriculum system of other connection modes.

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