10.18686/neet.v2i2.3913

Research on the Curriculum System of Top-up Degree Programs under the Background of New Engineering and Technical Disciplines

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Abstract: In response to the new round of technological revolution and industrial transformation, and to support and serve innovation-driven development, new engineering talents focus on the cultivation of practical and innovative abilities. At present, the proportion of upgrading from junior college to undergraduate in China has reached 20%. More and more vocational school graduates have the opportunity to receive high-quality undergraduate education, become skilled professionals. But the cultivation of this group of students is often overlooked by many universities. This study analyses the issues existing in the undergraduate curriculum system of local applied universities in undertaking vocational education. It is pointed out that the application of ordinary undergraduate curriculum systems is not suitable for vocational-to-bachelor's students and cannot meet the training objectives of higher vocational and technical talents. To cultivate new engineering vocational and technical talents, aiming at the current issues in the theoretical and practical settings of the curriculum system, this study proposes to use employment as a guide in the vocational-to-bachelor's curriculum system, set bridging courses to consolidate professional foundations, implement multiple training programs to promote student development, and collaborate with enterprises to carry out project-based practical training. It is necessary to optimize the construction of the curriculum system from theoretical and practical, and fully leverage the advantages of students' strong practical abilities, which will reserve high-level vocational and technical talents for the new round of technological and industrial revolution.

Keywords: Top-up Degree; Curriculum System; New Engineering and Technical Disciplines; Local Applied Universities

1. Introduction

With the introduction of relevant policies for the construction of "New Engineering and Technical Disciplines, " a comprehensive elaboration has been made on the objectives of running engineering majors and talent cultivation, emphasizing the need to accelerate the cultivation of engineering talents required for modernization construction and highlighting the importance of reform and innovation in teaching models [1]. To cultivate high-level vocational and technical talents needed for industrial development and break the " Academic qualifications only", the Ministry of Education of China proposed to allow more vocational school graduates to receive high-quality undergraduate education. According to the director of the Department of Vocational Education and Adult Education of the Ministry of Education, the proportion of top-up degree programs has reached 20% in 2022 [2]. Vocational colleges focus on practical operations in teaching, while undergraduate colleges mainly emphasize theoretical knowledge. After students enter undergraduate colleges, they strengthen their professional theoretical knowledge, but their operational skills are weakened, resulting in the outcomes of vocational-to-bachelor's education being similar to those of ordinary undergraduate graduates. This fails to meet the national and societal demands for skilled talents, deviating from the original intention of vocational education [3]. Under the background of New Engineering and Technical Disciplines, applied universities face significant challenges in cultivating emerging industries and new technological talents with professional and vocational skills at the undergraduate level of professional and vocational skills [4].

2. Present situation of curriculum system

2.1 Training objectives

The training goal of traditional engineering is to engage in planning, exploration, design, construction, raw material selection, research and management of senior engineering and technical talents in the corresponding engineering field, focusing on practical application ability. New engineering and technical disciplines focus on new knowledge and new technology, and cultivating students' innovation ability and com-

prehensive application ability of multiple disciplines. The proposal of new engineering and technical disciplines is an upgrade of traditional engineering [5]. In this context, local application-oriented colleges and universities generally are responsible for the education of junior college students after their upgrading. In the two-year study, education emphasizes the strengthening of theoretical knowledge, while operational skills are weakened to some extent. As a result, there is no difference between vocational undergraduate students and ordinary undergraduates, and even there is a gap. Therefore, the training goal of ordinary undergraduate is not suitable for this kind of students [6-7]. The reason is that the training of vocational undergraduates should not be separated from the training of technical skills in the previous junior college stage. Students have developed strong practical skills in the junior college stage. Application-oriented colleges and universities should continue their advantages, consolidate the theoretical foundation, and further enhance practical skills to train students' problem-solving ability and innovation ability without being separated from practical application [8]. Students who continue to study from junior college to undergraduate college have cross-school, cross-education types, cross-majors and other problems, which brings great difficulties to colleges and universities as the main body of training. According to the situation of students, a suitable curriculum system should be constructed to help students smoothly complete their study transition, give full play to their advantages of strong practical ability, and cultivate higher vocational and technical talents who can adapt to the current industrial upgrading.

2.2 Present situation of curriculum system

Most of the undergraduate students in local application-oriented universities in China are trained in four years. In the first two years, a number of theoretical courses are set as the foundation, and the core professional courses are studied in the last two years. However, the study of junior college students is generally three years, and the training of operational skills is carried out throughout [9-11]. Many application-oriented universities do not build a special curriculum system for junior college students, but directly adopt the training program of senior undergraduate students, resulting in knowledge fragmentation and rigidity of junior college students after entering the undergraduate colleges, unable to find a clear self-positioning, and great learning pressure [12]. The higher education in other countries also has the above problems, for example, some universities in the UK set TOP-UP DEGREE courses for Chinese students with 3-year junior college degrees or undergraduate degrees, which lasts for one year. These students move directly into classes and study alongside the UK undergraduates.

3. The existing problems in the current curriculum system

3.1 Ignoring basic theories

Local application-oriented universities are the predecessor of ordinary undergraduate colleges and universities with strong professional theory, which is different from vocational education. In the early stage, students who are going to vocational college lay emphasis on the training of operational skills, and lack a deep understanding of some general basic theories, such as the composition of computers and the conversion of different base numbers, etc. They are involved in multiple disciplines such as computer and electronics, and are closely related to multiple disciplines of new engineering. Such basic theoretical knowledge cannot be ignored. At present, there are still many junior college students who are exempted from the examination and promoted to the university after retirement. Such students cannot continue their classroom learning during the service period, and some basic knowledge has been forgotten when they return to the classroom, so it is difficult to keep up with the undergraduate course directly. At this time, simply adding basic courses of professional theory will make students with a good foundation feel that it is a waste of time to repeat theoretical learning in the junior college stage, but the lack of basic theory learning will make some students unable to connect with the professional course learning, and they will be afraid of difficulties at the beginning, and they will be unable to carry out in-depth thinking and further application. How to connect the curriculum to enable students from different schools, different majors and different levels to complete their professional learning is not a small challenge to the construction of the curriculum system.

3.2 Lack of knowledge linkage

In the current curriculum system, different courses are divided into different teachers to complete the teaching. In the actual teaching process, teachers will organize the teaching process strictly in accordance with the established teaching arrangements in order to achieve the teaching objectives. The teaching content is simply focused on the content of the specific course, lacking the introduction and combination of related curriculum knowledge. Each course is like a scattered bead, and students focus on completing the assessment of the course, ignoring the relevance of knowledge. And this is precisely the new engineering talents need to have the multidisciplinary comprehensive innovation ability. In the course system design, the logical relationship between different courses should be strengthened, so that students can connect knowledge of multiple disciplines together, and a course system suitable for the training of new engineering talents should be established.

3.3 The practice setting is not scientific

The teaching of practical training courses is mostly based on certain methods and steps to verify certain principles or phenomena, and lacks exploratory, research-oriented and open experiments, which cannot cultivate students' creative spirit and innovation ability, and is out of

step with the social demand for employment. This kind of verification experiment teaching is a repetition of the previous learning content for the students who have graduated from junior college, and they have a certain practical ability. Nowadays, with the rapid development of new technology, the curriculum system should be adjusted with the upgrading of industrial demand, oriented to practical projects, strengthen the cultivation of students' innovative thinking and creative ability, and carry out integrated education of theory and practice.

4. Suggestions on the construction of new engineering curriculum system

4.1 Stratified teaching

In order to build a curriculum system, it is necessary to analyze the situation of students and understand what courses students have learned before. Through research, application-oriented undergraduate universities should set up or supplement the backbone courses required by the Ministry of Education for new engineering majors. In addition to enabling students to meet the requirements of undergraduate level, courses related to professional cognition basis need to be added to the curriculum system. The curriculum construction of specialized courses introduces the concept and method of stratified teaching, and divides students into different levels by finding out the students in advance. The teaching content is designed for different levels, and the difficulty of various teaching resources is also graded. For students with a good foundation and strong understanding, we will increase the depth of project cases, exercises and periodic tasks.

4.2 Online platform construction

After several years of epidemic, more and more schools participate in the construction of online course content, so that teaching breaks through the limitations of time and space. Online courses have the characteristics of repeated viewing, which can improve students' self-learning ability and promote students' personalized development. In courses related to professional cognitive foundation, the advantages of online and offline mixed teaching are fully utilized, so that students with different foundations can master basic theories, strengthen professional cognition, and link up with subsequent professional course learning.

4.3 Multiple training programs in parallel

The construction of the curriculum system should pay attention to the integrity, relevance and taskness of the curriculum, make the curriculum from a single independent course to a closely related course group, and formulate the curriculum outline, standards and assessment standards and methods according to the new system. Colleges and universities should take professional employment as the guide, and provide a variety of training directions according to the characteristics of students from different majors. In the curriculum system, a single technology course is set up first, and then a comprehensive technology course composed of several single technologies is set up, which conforms to the cognitive law of students and improves the learning effect. The major of Computer Science and Technology of Beijing Union University has set up two major directions, WEB application development and robot development, according to the employment survey and student source, and established corresponding course groups to meet the learning interests of different students, as shown in Figure 1.

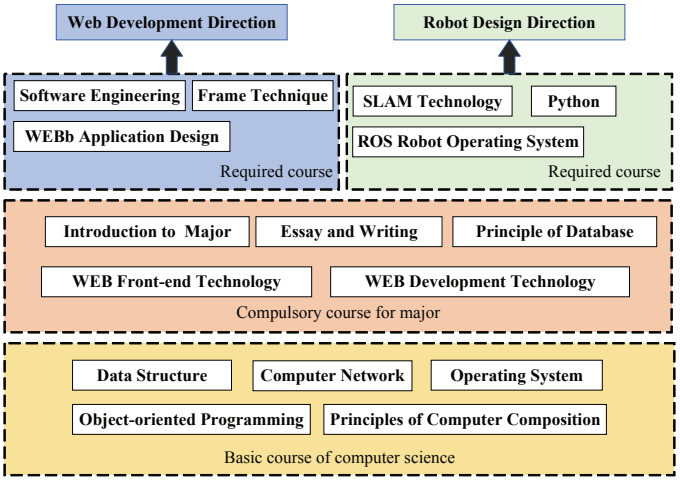

Figure 1 Curriculum system of computer science and technology major of Beijing Union University.

4.4 Carry out project-based training with enterprises

The implementation of practical teaching should follow the road of school-enterprise cooperation, and how to explore the new mode of school-enterprise cooperation will be the key to the cultivation of future professional talents. The application of technology professionalism is mainly to apply technology in actual work scenarios to cultivate students' ability to think independently and solve practical problems. In the training process, strengthen the cooperation with industry enterprises to enhance the cultivation of students' practical ability. In the first year,

lay a solid foundation of professional knowledge, carry out various industry cognition courses, such as professional perception and practice, enterprise cutting-edge technology lectures, enterprise visits, etc., and focus on professional course practice and short-term internship in industry enterprises; In the second year, I will carry out professional comprehensive practice, graduation internship and graduation design, fully integrate with the needs of industrial enterprises, carry out long-term project-type enterprise internship, and exercise and improve students' comprehensive ability. In this way, by simulating the actual combat of enterprise projects, developing other actual projects, entering the enterprise environment, and using enterprise resources to develop actual projects, students can naturally apply the technology they have learned professionally and become skilled talents who can solve practical problems.

5. Conclusion

In general, under the current background of new engineering, the exploration of the course system for upgrading to higher education is very important for training high-level professionals with vocational skills to meet the national strategic needs. In this process, the control of professional employment direction and accurate analysis of learning conditions can provide references for the construction of the course system. In view of the problems existing in the current curriculum system, such as neglect of basic theories, lack of knowledge linkage, and unscientific practice setting, it is proposed to optimize the construction of the curriculum system by adding courses related to professional cognition foundation, conducting more training programs in parallel, and carrying out project-type practical training with enterprises, which will help local application-oriented colleges and universities to improve the training quality of application-oriented talents. Enhance students' ability to innovate and solve problems, and cultivate more applied and skilled new technical talents for the country.

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Acknowledge: This paper is supported by R&D Program of Beijing Municipal Education Commission (KM202311417004) and the Education Reform Project of Beijing Union University (JJ2023Q009).