

## Preliminary Study on the Training Mode of Vocational Education Talents Following Engineering Logic

Yi Zhou, Xiaojun Jiang\*

Sichuan College of Traditional Chinese Medicine, Mianyang, 621000, Sichuan, China

\*Corresponding author

**Keywords:** engineering logic; higher vocational education; talent training

**Abstract:** Adhering to the principle of improving students' comprehensive ability and constantly exploring the curriculum teaching ideas that conform to the trend of the times is a historical choice for practicing employment-oriented reform. High-skilled graduates who are trained in engineering logic must be able to play the role of "adaptation, guidance, and support" proposed by the state. In order to achieve this goal, the training of vocational education personnel must fully integrate the needs of social reality and the professional needs of students, and position the training strategies and training objectives for the specific situation of students. To build a curriculum system that meets the future needs of the society and enhance the practical value of the curriculum, can better improve the professional quality of high-skilled students, and provide a good foundation for future employment and even life development.

### 1. Introduction

Vocational education is an indispensable part of China's higher education and an important driving force for the development of China's productive forces<sup>[1]</sup>. For a long time in the past, vocational education was in a relatively embarrassing situation. The society pays too much attention to the qualifications of graduates, and the requirements for their practical ability are not high<sup>[2]</sup>. This has caused the public to feel "Powerless" for vocational education, lacking attention and enthusiasm for the development of vocational education, and leading to the positive role of vocational education in promoting national construction. With the introduction of a series of "industrial rejuvenation" strategies by the government in recent years, vocational education has received more and more attention from the society<sup>[3]</sup>. Various ideas on vocational education and teaching innovation are constantly improving, which has made China's vocational education flourish. Engineering logic orientation is an innovative idea that has been widely debated in the vocational education community in recent years.

### 2. The theory of engineering logic and its application

Engineering logic theory emphasizes that students are required to have the ability to solve complex engineering problems when they graduate. Specifically, it is able to combine the knowledge of the professional and the non-professional general knowledge to design a problem solution with innovative value and practical value and conform to the social industry norm in engineering logic. It is actually a teaching philosophy that emphasizes the mode of "teaching results determine teaching content". In this theory, the most important thing is the requirement of "having the ability to solve complex problems", which is also generally lacking in China's vocational education and even higher education. The relevant standards of engineering logic theory generally follow the "Washington Agreement" formulated by the American Engineering Association at the end of the last century. In 2016, China officially became a full member of the Washington Agreement, marking that China's vocational education has gained worldwide recognition after years of rapid development.

Engineering logic theory is not a simple teaching method, but a comprehensive and innovative

concept of vocational education development. It is a subversion of the teaching model of "fixed teaching ideas - fixed assessment content" that has been practiced in the past. It emphasizes the focus of teaching work on the ability of students to solve problems, so that students can truly have practical ability rather than accumulation of knowledge during their studies. In the engineering logic mode, students who want to meet the standards required for graduation must fully mobilize their brains, hands, and minds to participate in the collaborative work. They can achieve comprehensive use of their majors and cross-professional knowledge.

### **3. Several basic principles of engineering logic theory**

The implementation of engineering logic theory in the vocational education personnel training system needs to follow the basic principles of the following aspects. Breaking away from these basic principles, engineering logic theory has become a passive source of water, and it is difficult to harvest real results.

#### **3.1. Focusing on improving students' comprehensive ability**

At this stage of China, China is in the critical period of the structural adjustment of the supply side. The spirit of artisans in the big countries is booming in China, and the adjustment and optimization of various industrial structures have been promoted and broke through by economic development with the help of "fine work" and "brave innovation". The adjustment of industrial institutions and the advancement of technology have accelerated the pace of upgrading the demand for occupational structures. The contradiction between the extreme desire of social production for high-end talents and the relative surplus of low-end labor supply has become increasingly prominent. The connotation of many traditional professions has undergone major changes, and the technical level, intelligent functions, and production methods involved have changed dramatically. In contemporary society, body-brain coordination, mental skills, and cooperative communication skills are gradually becoming the focus of recruitment companies. These changes require workers to have the ability to collect, think about, and use existing conditions to solve problems. Therefore, the practice of engineering logic theory must pay special attention to improving students' ability to think and solve problems.

#### **3.2. Active innovation in the curriculum system**

First of all, it is necessary to scientifically establish a professional ability orientation, aiming at the job requirements that graduates may face when they are employed, and construct a curriculum system with comprehensive ability training as the core. This is an important means to shorten the adaptation period of students and improve their career development potential. Therefore, it is necessary to take the position of the ability of the position as the direction, and closely develop the curriculum content of each major around the national curriculum standards. Second, we must pay attention to the openness of the course content. In contemporary society, vocational colleges are more closely linked to social production. Compared with other undergraduate colleges, the vocational education curriculum system is based on production practice, closely following technological innovation, and is aimed at social needs, and is more dynamic and open. Enterprises lead the construction of the curriculum system with job requirements, and enrich the content of the curriculum with "new equipment, new technology and new management" produced by the society. Schools actively dock with their counterparts, so that enterprises can put forward actual needs and select business backbones to participate in curriculum development. In the explanation of some specific operational priorities, media equipment can be used to make small videos, enrich curriculum resources, and keep the curriculum system consistently linked to the same line of production.

#### **3.3. Focus on improving students' self-learning ability**

Vocational education should also focus on improving students' self-learning ability. This is one of the biggest differences between engineering logic theory and traditional teaching mode.

Engineering logic theory is guided by the goal of student training, with the core of improving students' ability to analyze and solve problems. Therefore, practicing the theory of engineering logic must reflect the "student-oriented" teaching ideology, focus on students, and guide them to actively and actively learn and improve. Vocational colleges should strive to develop corresponding teaching strategies and counseling programs based on the actual ability of students, and enhance students' interest in learning through a variety of curriculum systems.

#### **4. Problems and causes of talents training in vocational colleges in China**

Although China's vocational education has made rapid progress in recent years, both the teaching mode and the teaching effect have made all-round progress, in-depth analysis, we can find that there are still many serious problems<sup>[4]</sup>. The work of many vocational colleges in teaching mode, curriculum system construction and goal orientation is obviously lagging behind, which has greatly delayed the training of talents in vocational education in China.

##### **4.1. The teaching ideas are solidified, and the theory and practice are out of touch**

At present, many vocational colleges still adopt traditional indoctrination in the process of teaching development. Very few teachers can encourage students to ask questions about learning content in daily teaching. Teachers in the classroom according to the text, most students are "thought drifting" Among them, there are factors such as low concentration of students in vocational colleges and poor study habits. But the key thing is that the teacher lacks interaction with the students in the classroom. The vocational education classroom has become the stage for the teacher alone. Even if the knowledge points are explained, the preset teaching tasks are completed. This kind of thinking leads to the lack of changes and innovation in the classroom teaching mode. In addition, the colleges and universities separate the theoretical teaching from the practical teaching into two independent units, which lack the connection between each other. Students can't combine the two well when conducting theoretical or practical learning. Even if teachers emphasize the emphasis on certain key knowledge in teaching, it is difficult to help students to develop a deep understanding of science. They can only rely on the method of rote memorization, which naturally cannot achieve the desired learning effect.

##### **4.2. Lagging behind the construction of the curriculum system**

The core of engineering logic theory is to enhance students' ability to solve problems, and the scientific curriculum system will undoubtedly play a multiplier role in the cultivation of students' ability. However, from the reality, there are still serious lags in the construction of the curriculum system in vocational colleges in China. Some vocational colleges still follow the administrative arrangement model of the last century in the construction of the curriculum system, and cannot be directed at the characteristics of their own profession and the advantages of the school in the field of teaching. Highlighting the professional ability of students in the cultivation of talents is the most prominent feature of vocational education, and it is also the place where vocational education should be strengthened in terms of curriculum.

The concept of engineering logic requires vocational education to focus on cultivating students' scientific thinking at the curriculum selection and organization level, and to change the educational concept that has always focused on knowledge transfer and light practical ability. The students will be trained as "specialized and multi-functional" professionals. On the basis of proficiency in the professional skills of this profession, they must have a certain understanding of other related fields, and have a more mastery of their cross-contents. . However, from the reality, some colleges and universities in China are still divided into traditional disciplines in the curriculum design, which emphasizes the "portal boundary" between various disciplines. It is easy for students to constrain their thinking within the professional knowledge system when solving problems, which is very unfavorable for the improvement of students' professional ability.

### **4.3. The comprehensive ability of teachers is urgently needed to be improved**

In 2018, there are more than 1.3 million full-time teachers in vocational colleges in China, of which 40% are teachers with “double-type” teacher qualifications. The strength of teachers' ability plays a crucial role in the cultivation of talents in schools<sup>[5]</sup>. The important reason for the poor comprehensive ability of full-time teachers in vocational colleges is the lack of collective teaching and research. For a long time, the external pressure on vocational education in China is far less than that of high school education. This makes the management of full-time teachers loose in most vocational colleges. Teachers have to come to class and leave school after class. The teaching and research group discussion system for collective teaching research activities is ineffective. In addition, the on-the-job training for teachers is procedural and superficial. Although the country invests a lot of money in this field every year, the actual results achieved are not satisfactory.

## **5. Advising engineering logic and strengthening the training of talents in vocational colleges in China**

Through in-depth study on the development of vocational education in Europe and the United States, this paper puts forward some suggestions for promoting the construction of talent training system in vocational colleges in China based on the theory of engineering logic.

### **5.1. Focusing ability improvement, innovative teaching mode**

Vocational education itself has a very close relationship with social production, and it has great advantages in realizing theoretical learning and practical learning to share high-quality resources. Therefore, vocational colleges should focus on improving students' ability, and create flexible and changeable teaching methods according to the specific conditions of students and the characteristics of the profession.

First of all, we can establish a three-dimensional credit management system, replacing the original rigid requirements in teaching with flexible academic system and elective course system. This not only enhances the diversity of vocational education, but also effectively mobilizes students' initiative. The credits for vocational education colleges consist of two parts: basic credits and additional credits. Basic credits are mainly obtained through the study of specialized courses, while additional credits are obtained by students through elective courses. The credits are tied to the student's bursary level to exert some external pressure on their learning. In addition, for the objective factors such as the difference in the learning ability of vocational education students, we can try to replace the traditional semester system with flexible academic system. For students who have strong learning ability and can complete course subjects in a short period of time, credits can be awarded in advance, while those with weak learning and learning ability should extend their study time and achieve assessment in terms of performance, especially ability. The standard can only be awarded credits, which enhances the management pressure of the school, but it guarantees the quality of the graduates and also makes the students' learning more powerful.

Second, we must adjust the innovative student learning model. Limited by objective conditions, there are indeed many shortcomings in the allocation of student training equipment in vocational colleges in China. Students' participation in practical training practices is relatively limited and concentrated, and cannot be optimally linked with theoretical learning. Therefore, the transformation of student learning patterns should focus on improving the efficiency of practical learning, ensuring that all aspects of practical activities are expected to be effectively implemented. The school strengthens the traction incentive for students, takes the attendance rate and completion rate of practical classes as an important assessment basis for credits, changes the practice of single examination results, establishes an electronic file of practical operations, and regularly accumulates videos of students' operations by enterprises. The business backbone conducts spot checks to discover details such as non-compliant actions. Teachers encourage students to work together in groups to complete practice tasks in the form of group discussions. At the same time, teachers mark

the required competency standards when issuing practical tasks, so that students can better choose the focus of their practical learning by comparing their strengths and weaknesses.

## **5.2. Focus on optimizing the curriculum system**

Whether the curriculum system is scientific and reasonable has a direct impact on the effectiveness of the curriculum. Therefore, continuously promoting the optimization of the curriculum system is an important focus for improving students' ability to solve problems.

First of all, we must scientifically allocate the proportion of professional courses and elective courses. The professional course refers to the compulsory course of the student's major, which is the most direct embodiment of the professional characteristics. Optimizing the proportion of professional courses and elective courses should be based on the professional construction of the disciplines, emphasizing the skills of students in this field, on this basis, the integration of multi-disciplinary knowledge is realized, and the foundation of the discipline is deepened, and the division of disciplines is eliminated. The formation of professional courses and elective courses complement each other.

Secondly, optimize the ratio of theoretical courses to practical lessons. With the increasing emphasis on vocational education in China and the wide application of information technology in the field of vocational education, the practical resources are not only more than the past, but also more rich in style, students can practice training in more ways. This provides a good material basis for vocational colleges to better carry out practical teaching. With this as a guarantee, vocational colleges should boldly implement the teaching reform that advances the theory teaching and practice, and develop a more open, comprehensive and innovative practical simulation system, so that students can deepen their understanding of the theory in practice. It also applies theory learning to projects that guide practice. Emphasis is placed on cultivating students' ability to relate to their own theories in the face of problems, so that they can better adapt to the challenges of future career development.

## **5.3. Promote the improvement of teachers' comprehensive ability**

As is known to all, students in vocational colleges in China generally have poor self-learning ability, and their dependence on teachers' quality far exceeds that of other countries. Vocational colleges should strengthen the management of full-time teachers and give full play to the important role of academic research in improving teachers' ability. In the process of vocational education, it is inevitable that the content of teaching will lag behind the changes in production at the forefront of the times. Teachers strengthen the interface between their own knowledge system and the cutting-edge knowledge structure of the times, shortening the buffer period during which vocational college graduates combine their original knowledge system with the actual needs of their positions at the initial stage of employment. Society encourages teachers to better adapt to the new requirements of vocational education and better utilize their professional abilities through active learning and on-the-job training. From this point of view, in the practice of engineering logic theory and the cultivation of professional talents in the new era, vocational colleges must make overall considerations for the improvement of teachers' job skills. The formation of special skills as the core, the relevant field is to expand the comprehensive capacity training system, and strive to achieve the combination of post practicality and potential improvement.

## **6. Conclusion**

The continuous development of the times has put more difficult demands on vocational education. Improving the ability of vocational college students to solve problems is the key goal of our future work. It requires the synergy of each relevant level in order to make vocational education better become a powerful boost to socialist construction.

## **Acknowledgements**

This study was supported by Sichuan Department of Education 2022-2024 Vocational Education Personnel Training and Education and Teaching Reform Research Project (22JGZD08), Sichuan Province 2022 Educational Research Program "Grant Program" (SCJG22A276), and 2022 Mianyang Social Science Research Project "Special Project for Basic Education Research" (MSJJ22-B28).

## **References**

- [1] Zhang Zhengfeng. The Transformation of Vocational Education Development Mode under the New Normal of Economic Development[J]. Journal of Jiangsu Vocational College of Economics and Trade, 2018(1): 68-70.
- [2] Liu Xiao. Development of Vocational Education under the Perspective of Practice Philosophy: Dimensional Consideration and Realistic Thinking [J]. Vocational Education Forum, 2018(2): 13-20.
- [3] Chen Xinguang, Zhang Haiping, Zhang Yayun. Thoughts on Accelerating the Development of Vocational Education in China[J]. Science Development, 2018(1): 106-113.
- [4] Xiao Jing. Challenges and Countermeasures in the Development of 2030 Vocational Education[J]. Education and Occupation, 2018(1):10-16.
- [5] Zhao Lingzhen, Yuan Hongping. Research on the Construction of Teacher Development Center in Higher Vocational Colleges Based on Promoting the Modernization of Vocational Education[J]. Education Modernization, 2018, 5(44): 124-127.