

# *Exploration and research on bilingual teaching of engineering training in the context of engineering education certification*

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**Abstract:** Engineering training is an important practical link of undergraduate education and an important part of professional certification of engineering education, and bilingual teaching is a trend towards the development of international education. This paper analyses the shortcomings and reasons of bilingual teaching in the current domestic engineering training courses from multiple aspects, and puts forward methods such as breakthrough in key selection, curriculum system construction, and immersive teaching experience, aiming to improve the comprehensive quality of students, meet the requirements of engineering education certification, and improve the level of discipline and professional development.

## 1. Introduction

In 2016, China officially joined the Washington Agreement, one of the most influential international agreements on mutual recognition of engineering education degrees, and officially launched the engineering education certification work in China. Graduates who pass this certification are also recognized by other members of the organization. Engineering education certification can greatly improve the international competitiveness of China's engineering education, in line with the world and international standards, for engineering education reform and development service has pointed out the direction, to adapt to the needs of the government, industry and social services<sup>[1-3]</sup>.

As an important part of the internationally recognized engineering education certification, whether graduates can independently read foreign technical literature and books and communicate with others is a very important indicator<sup>[2]</sup>. How to integrate higher engineering training education into higher engineering education system, give full play to the role of higher engineering practice education, and cultivate and tap students' practical skills and innovation potential are important

issues facing engineering training courses. However, engineering training in most domestic colleges and universities is often aimed at teaching and instructional training for domestic students, and bilingual teaching time is obviously insufficient. All equipment including operation methods and professional knowledge are based on Chinese, and training and teaching staff have relatively low requirements on foreign language level<sup>[3-5]</sup>. The students' professional English ability has not reached the requirement of the current trend of economic globalization and the goal of training applied talents.

This paper discusses and analyzes the present situation, necessity, improvement methods and measures of bilingual teaching of engineering training under the background of engineering education certification. Combined with teachers' teaching plan and the improvement of students' comprehensive quality, the reform methods are given.

## **2. Analysis on the necessity of combining engineering training and bilingual teaching under the background of engineering education certification**

Engineering education certification is an important part of our higher education, plays a very important role in our higher education system. Especially in the process of industrialization of our country, engineering education certification to form and develop a complete, independent industry system plays an irreplaceable role. Engineering education professional certification is an internationally recognized quality assurance system for engineering education and an important basis for international mutual recognition of engineering education and engineer qualifications<sup>[2]</sup>. The key to certification in engineering education is to confirm whether engineering graduates meet the accepted standards of talent quality. This is a way of qualification assessment oriented by training objectives and graduate quality requirements<sup>[4,5]</sup>. Its certification has been widely recognized by international peers. With an engineering education certification, graduates can be recognized by other Washington Protocol member organizations. For our engineering specialty and international development line has an important push function and significance. At the same time, it puts forward higher request to the teaching ideology and education mode of Chinese college engineering specialty. A convenient result of mutual recognition of majors is that our graduates who are certified in our country can go abroad to pursue higher level graduate degrees, and so on. Some schools accept applications from undergraduates under the audit system, which puts higher requirement on foreign language level of students who need to study abroad, while practical work can't be replaced. Therefore, the necessity of bilingual teaching in engineering training is further highlighted.

The engineering training centers of most universities in China mainly provide teaching and guidance training for domestic students, and there is little demand for bilingual teaching<sup>[6]</sup>. All equipment including operating methods and professional knowledge are based on Chinese language, which requires relatively low foreign language proficiency of the teaching staff. Most of the training instructors in colleges and universities have a bachelor's degree or less, which makes the guidance effect of training general, bilingual teaching is more difficult to implement. Relying on this kind of teaching method, which cannot be in line with the international practice, we just blindly follow the teacher's guidance for training in class, which results in that the students' professional English ability cannot reach the requirements of the training goal of applied international talents<sup>[7-9]</sup>. It will also reduce students' interest in exploring advanced manufacturing and processing technologies in the mechanical field. Bilingual teaching of engineering training is helpful to improve the training level of participants in the whole teaching process.

Mao Mao and Liu Junyi<sup>[1]</sup> explored and optimized the bilingual teaching program of work training course based on the practical results of engineering training for foreign students in Nanjing

University of Technology. Wang Xianfeng<sup>[3]</sup> combined with the background of double first-class construction, proposed to train international talents who conform to the international development trend and can communicate and exchange in different languages and different cultural environments.

### **3. Analysis of the current situation of bilingual teaching of engineering training in the context of engineering education certification**

In recent years, under the background of engineering education certification, the national education department has vigorously promoted the development of engineering training courses, and domestic colleges and universities have also made great progress in the teaching and research of engineering training courses, from the upgrading of teaching equipment to the introduction of high-quality talents. Engineering training is a basic course closely combining theory and practice, allowing students to get close to mechanical manufacturing equipment, in-depth understanding of mechanical manufacturing knowledge, learn the basic application of mechanical equipment, can cultivate students' engineering practical training ability, stimulate students' sense of innovation, and at the same time improve students' professional foreign language ability to meet the requirements of engineering education certification<sup>[8]</sup>. However, most university engineering training centers lack the bilingual teaching ability of courses, which is mainly due to the fact that most engineering training centers mainly undertake the teaching and practical training tasks of engineering training courses for domestic students, and the requirements for bilingual teaching ability are not high, and the course teaching mode of all projects is still based on Chinese. Secondly, the English level of teaching staff is limited, and it is difficult to undertake the bilingual teaching task of the course, which hinders the development of bilingual teaching of engineering training courses, and it is difficult to realize the transformation of engineering training courses from Chinese teaching mode to bilingual teaching mode in the short term.

At present, there is still a certain gap between the goal of bilingual teaching and engineering education certification in general college engineering training, and these gaps are reflected in many aspects, and there are many difficulties in the complete implementation of bilingual teaching<sup>[10-12]</sup>.

First, there are many types of engineering training programs, and there is no highlight of the key courses of bilingual teaching of engineering training. Engineering training involves turning, milling, special processing (wire cutting, laser processing), CNC lathe, CNC milling, fitter, sand casting, 3D printing and many other advanced processing and manufacturing technologies, each processing and manufacturing technology has a strong professionalism, the span between projects is large, the professional foreign language ability of teaching staff is extremely high, the foreign language ability of general college teaching staff is difficult to achieve, cannot train students who meet the requirements of engineering education certification and international standards<sup>[13]</sup>.

Second, the class hours of engineering training are short, the learning process is more scattered, and there is no long-term effective learning memory for students. Engineering training time is generally about 2-3 weeks, students are difficult to master all theoretical knowledge and equipment control methods, the learning process is scattered, different projects need different teaching staff for guidance, so a large number of teaching personnel are required, and all teaching staff are required to have a high level of foreign language<sup>[12,14]</sup>, teaching staff is also difficult to macro control the professional ability of students, which is not conducive to timely discovery of problems arising in the teaching process, teaching mode reform and development is slow.

Third, equipment operation is dangerous and complex, and it is difficult to integrate with bilingual teaching. Most colleges and universities arrange engineering training courses in the freshman or sophomore year, while professional foreign language courses are arranged in the junior

or senior year, so that during the engineering training, the trainees have not been exposed to professional foreign language courses, and it is difficult to understand the professional terms and professional terms involved in bilingual teaching, which also increases the teaching difficulty of engineering training teaching personnel and affects the teaching process<sup>[13,15]</sup>. Since most students have not been exposed to professional foreign languages, it is easy to misoperate the equipment when operating the equipment, causing danger and affecting the personal safety of students.

Fourth, the practical teaching process lacks corresponding bilingual practice, communication and interaction. Bilingual teaching tends to be dominated by teachers, who often translate expertise directly and conduct superficial analysis in the classroom. This is not conducive to students' in-depth understanding and mastery of professional knowledge, nor is it conducive to the improvement of students' professional English level. It is difficult for students to communicate and interact bilingual during the practical training<sup>[14,15]</sup>. Such a bilingual teaching mode is not flexible enough, lacks diversity, cannot effectively stimulate students' enthusiasm and subjective initiative, students' passive learning, poor learning effect, will also lead to students' ability in professional English cannot meet the requirements of today's economic globalization trend and application-oriented talent training goals.

#### **4. Bilingual teaching and exploration of engineering training**

Engineering training needs certain professional knowledge and practical operation ability. Engineering training course has strong practicality, which is a basic practical course set up by colleges and universities to cultivate compound talents and improve students' practical operation ability. Engineering training courses are a comprehensive course integrating theory and practice. Integrating theory into practice can enable students to have a better understanding of professional knowledge. Bilingual engineering practice courses can strengthen students' professional English ability and cultivate talents in the new era in line with international standards. In the context of the globalization of higher education and the rapid promotion of engineering education certification, bilingual teaching is a new direction of exploration and research on the teaching mode of engineering training courses, and various methods can be adopted to ensure the effect of bilingual teaching.

##### **4.1. Engineering training courses and regular training courses shall form a bilingual system**

Different from the other regular courses, in the engineering training course, a wide variety of training programs, and requires students to master the relevant professional knowledge of machining and manufacturing, even using Chinese teaching can be difficult for beginners, therefore, the formation of a bilingual teaching system of engineering training courses can optimize the bilingual teaching scheme, let the students clarify the dual goals of practical training content and foreign language learning before class; introduce theoretical knowledge through the course background, increase English listening, speaking, reading and writing activities for a more full preview, let the students have a basic understanding of each training program; engineering training programs can be selected before teaching, students can also choose according to their own interests, increase students' initiative in learning; for students at different levels, through the course content adaptation and the provision of supplementary materials, make the course content more targeted to connect the theoretical basis of students at each level. The pre-class introduction can take various forms, such as writing bilingual preview teaching plans, encouraging students to discuss in foreign languages, making knowledge trees, micro-class videos, etc., focusing on presenting the course content objectives, helping students to clarify their course background and experience background, so that all students can understand, master and interpret new concepts.

## **4.2. Increase the flexibility of the guidance and training programs**

The process of engineering training includes two links: theoretical teaching and equipment operation, among which equipment operation is the focus of engineering training. Because the engineering training process is relatively scattered, and the practical training projects involve more professional terms, the comprehensive English teaching mode cannot be realized in the short term, so the teaching staff should flexibly adjust the teaching mode, and explain the theoretical knowledge in the demonstration operation, so that students can feel the combination of theory and practice more intuitively. In the operation stage of practical training, bilingual operation can be explained, and the places difficult to understand foreign languages can be explained in Chinese, which can promote students to master the training content and reduce the hidden danger of operation accidents.

## **4.3. Strengthen English communication in engineering training courses and introduce immersive teaching.**

Bilingual course of engineering training is a practical and engineering applied course that combines specialized course explanation with foreign language teaching. Students can be encouraged to freely participate in the bilingual discussion and communication, by explaining the examples of processing and manufacturing. Through discussing and finding the problems, the teaching staff should actively help the students to solve the problems. Can also arrange tasks after class, enhance students 'autonomous learning ability, let students after class using library, library platform to consult related professional literature, prepare relevant information in the next engineering training class in foreign language communication and interaction, in order to improve the students' professional ability in the field of related professional and English communication ability, meet the requirements of engineering education certification.

## **4.4. Students are encouraged to complete the practice and document writing in bilingual form**

Before the engineering training, students can be required to understand the relevant content of each teaching link of the course in advance, after the project, students can be required to summarize the whole engineering training process, students are encouraged to write engineering training reports in bilingual form, and actively analyze the problems in the engineering training. Q & A courses can be offered to solve students' questions. Through continuous exploration and research, the engineering training content of each project is integrated to form a new method of bilingual teaching of engineering training courses under the background of engineering education. Through this exploratory teaching method, the cultivation concept of bilingual teaching can be continuously enriched, so that students can master the advanced manufacturing and processing technology in such active exploration and learning, stimulate the consciousness of innovation, exercise their engineering practice ability, and improve their comprehensive quality. At the same time training guidance teachers also want to reflect, improve the efficiency of teaching, teaching to produce high quality results, found in the insufficiency in the process of teaching, and targeted solutions, improve the engineering training course bilingual teaching methods, make engineering training bilingual teaching results can fit with the goal of engineering education certification.

## **5. Conclusion**

With the promotion of the "Education Power" strategy and the "Belt and Road" initiative, the internationalization process has entered the fast lane, and we must clearly understand that China

still has a long way to go from an education country to an education power. In order to cooperate with the relevant policies in the context of engineering education and push the level of engineering training in China to a higher level, bilingual teaching cannot be avoided. This paper puts forward the reform methods of engineering practical training education, such as breakthrough in key selection, curriculum system construction, and immersive teaching experience, which are of great significance to the exploration of bilingual teaching of engineering training, and the specific teaching methods need to be adjusted in the actual teaching link. Engineering training is an important practical link of undergraduate education. The difficulties in bilingual education mentioned in the article and the proposed solutions are of reference significance to relevant practitioners. Many methods can quickly improve students' English quality, quickly meet the requirements of engineering education certification, and ultimately improve the level of discipline and professional development.

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