

# Research and practice of bilingual teaching of Mine Ventilation and Air Conditioning course

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**Abstract:** Bilingual teaching of professional courses is an important means to cultivate high-quality composite talents with international vision. Bilingual teaching can not only strengthen the exemplary role of the course, but also enhance the innovative consciousness and English application ability of high-level talents. Mine Ventilation and Air Conditioning was taken as a platform to carry out a study on bilingual teaching of professional courses in this paper. Through the methods of investigation, analysis, analogy and practice, the teaching philosophy, objectives, methods and the construction of teaching staff of bilingual teaching were studied in this paper. The study results show that the keys to improving the quality of bilingual teaching are to correctly understand the status and role of bilingual teaching, clarify its teaching philosophy and objectives, strengthen the teaching practice and application of language, and highlight the construction of bilingual teaching teachers and the selection of teaching materials. Through the practice of bilingual teaching, good teaching results have been achieved.

**Keywords:** Mine Ventilation and Air Conditioning, Bilingual Teaching, Teaching Staff, Teaching Philosophy, Teaching Practice

## Introduction

With the rapid development of China's economy, technology, etc., and the increase in international participation, especially the construction of the Belt and Road, China's political, economic and cultural interactions with the outside world are becoming more and more frequent, which urgently requires future talent beings to have both modern professional knowledge and skills, as well as proficiency in foreign languages. Bilingual teaching is a teaching form that uses a foreign language to teach a non-foreign language course, which involves two very different languages, Chinese and English. The dual purpose of bilingual education is to acquire specialized discipline knowledge and enhance foreign language skills through the learning of specialized disciplines. From the current viewpoint, the main problems in bilingual teaching in colleges and universities are as follows: ① Bilingual faculty is a serious shortage. ② Teachers with high foreign language proficiency generally do not have professional knowledge. ③ Teachers with professional knowledge have low foreign language proficiency, especially relatively low oral expression ability. ④ The appropriate original bilingual textbooks are in relatively short supply. ⑤ The students' foreign language proficiency is uneven and their enthusiasm for learning is low, etc. Although some discussions have been made in the above aspects, in fact, in the process of implementing bilingual teaching, there are still many problems such as updating the teaching philosophy, reexamining the teaching content, improving the teaching form and teaching methods, and teacher training, which need to be studied and explored comprehensively.

## 1. The basic role of bilingual teaching in professional courses

After several years of practice of bilingual teaching in professional courses, its basic role can be summarized as follows: ① English teaching is gradually infiltrated into the daily professional teaching activities of the discipline, which improves the teachers' ability to listen, read and write, as well as develop the students' ability to apply English in practice. ② Students' ability to understand and express professional theories in English is enhanced, which guides them to use more English materials, and deepen their further understanding of advanced foreign knowledge systems and thinking methods. ③ Original bilingual textbooks are used. Teachers and students can better understand the differences between original textbooks and domestic textbooks in terms of writing ideology, system structure, content selection, and exercise configuration. In the process of learning such textbooks, students can understand the disciplines they have learned from another perspective, so as to broaden their horizons and deepen their understanding. ④ Through the research of bilingual teaching contents, teaching methods, teaching means and teaching forms of professional courses, a preliminary teaching model of bilingual courses is formed, and gradually promoted by taking the point as a whole. ⑤ A good environment is created for students to apply English, so that students can better write academic papers in English, present their academic views in English at international academic conferences, and improve their international competitiveness.

## 2. Practice of bilingual teaching in professional courses

### 2.1 Teaching philosophy

Teaching philosophy is a concentrated expression of people's understanding of the inner laws of teaching and learning activities, as well as is the basic attitude and concept that people hold about teaching activities. In the process of bilingual teaching of Mine Ventilation and Air Conditioning, we always grasp the interactive nature of teaching, the subjectivity of students and the constructive nature of knowledge. ① Emphasizing the interactivity of teaching and learning. In the teaching process, teachers design various forms of interaction (between teachers and students, between students) and organize students to learn in different forms (such as answering questions in Chinese and English, etc.) in the interaction. The initiative, consciousness and creativity of the students are given full play in the interaction. The internalization and extension of different forms of interaction are used to promote the full development of students' knowledge, abilities

(including the reading and understanding of scientific and technical literatures in English, and the application of the English language itself) and qualities. ② Cultivating students' initiative in learning. It is teacher-led and student-centered. Teachers pay special attention to mobilize students' learning enthusiasm, strive to enhance students' autonomy, cultivate students' creative consciousness and innovative thinking, improve students' ability of self-regulation and self-control, and allow students to achieve the development of their own discipline abilities. ③ Refining the constructive nature of knowledge. Teachers focus their teaching attention on the inner changes of students, guide them to actively select (process) external information and actively explore the inner connections of knowledge. In teaching practice, students are often provided with auxiliary single professional English, such as Ventilation Optimization at the Yima coal mine, etc. Bilingual teaching fosters professional learning in both English and Chinese, allow students to explore and master specific learning processes and develop their own unique learning methods.

## 2.2 Teaching objectives

Teaching objectives refer to the direction of teaching activities and the expected results, and are the starting point and final destination of all teaching activities. We break down the course learning into a sequence of well-defined parts (from simple to complex), stipulate the final results achieved by the teaching and learning activities. Namely, it achieves the learning of the whole course through the realization of simple learning behaviors one by one. ① Students master the basic concepts of mine ventilation system, the basic ideas and basic methods of design. Through classroom teaching, experimental operation and course design, students can understand the composition, function and effect of mine ventilation system, correctly calculate mine air volume and resistance, reasonably select mine ventilation power and ventilation structures, and complete the basic training of coal mine ventilation safety engineer. ② Students are familiar with the basic process of analysis and problem solving of mine ventilation system optimization. Through theoretical analysis of mine ventilation system and practical case lectures, students can master the basic procedures of site investigation of mine ventilation system, find out the actual problems of mine ventilation system, and thus propose ideas to solve the problems. ③ Students have the basic skills to solve mine ventilation and air conditioning. Through different types of experiments and practical sessions such as the measurement of ventilation systems, we strengthen the cultivation of students' hands-on skills and give them the basic ability to solve practical problems and conduct scientific research. ④ Students understand the latest development of mine ventilation and air conditioning technology. Teachers introduce the latest theoretical development and practical application cases of the discipline into the classroom, activate and expand the basic knowledge that students have mastered, and improve the update rate and applicability of knowledge. ⑤ Enhancing the ability to retrieve and read scientific and technological documents in English. Through the teaching methods (Chinese and English) and the explanation of the original English textbooks and English scientific and technological materials, it can cultivate and improve students' interest and ability in reading English scientific and technological materials, and guide students how to obtain English scientific and technological materials from various types of literature resources. ⑥ Improving the level of international scientific research and academic exchanges. Teachers adhere to the principle of coordinated development and comprehensive improvement of knowledge, ability and quality, absorb and integrate foreign language teaching features, gradually cultivate students to use both Chinese and English thinking modes for professional learning, enhance students' ability to understand and express professional theories in English, and extend the tentacles of academic research to the world.

## 2.3 Classroom teaching ideas

The course Mine Ventilation and Air Conditioning is a specialized course. Students have built up a certain perceptual understanding through the learning of professional foundation courses and professional prior courses, as well as through production practice in coal mines. However, they do not have much knowledge of English vocabulary in professional courses. Therefore, in the beginning of course teaching, students' English level and receptivity should be fully considered. The general idea of our design is to take Chinese teaching as the main body and English teaching as the infiltration in the initial stage of teaching. However, in the teaching process, especially in the middle and later stages, as students become familiar with and master the specialized vocabulary of this course and become accustomed to the English expressions of the teacher's classroom lectures, the teaching in English may be appropriately enhanced. That is, teachers integrate Chinese and English, regardless of the primary and secondary, as the main body of each other. Taking into account the specific situation of students, the bilingual teaching of professional courses is roughly divided into the stages of infiltration teaching and integration teaching. ① Infiltration teaching stage. At this stage, most of the terminology is expressed in two languages, except for the classroom language (English). The aim is to increase students' professional vocabulary and to prepare them for the next stage of "integrated teaching". At the same time, students are provided with some simple professional English materials (such as relevant scientific and popular English readings) to read, so that students can expand their vocabulary and understand the knowledge structure of the course perceptively and directly. ② Integration teaching stage. During the instructional period, English is integrated into the instructional activities at the right time, in conjunction with the first half of the class period. Some knowledge is taught in English, appropriately supplemented by Chinese explanations, such as the knowledge of easy understanding, non-difficult (key), weak professional concepts, or professional knowledge that students have already understood. The aim is to fully motivate students to think and develop their ability to understand professional knowledge in English.

## 3. Bilingual teaching's faculty construction for professional courses

The specialized teacher's inability to fully master English and the lack of systematic expertise of English teachers are the main problems in the process of bilingual teaching of specialized courses in our university at present. When it is difficult to import teachers, how to build a localized bilingual teaching team is crucial to improve the quality of bilingual education. We have focused on the following. ① Sending out. We send teachers to foreign mining universities for short-term specialized training in bilingual teaching of disciplines, and

lay out faculty training plans of long-term bilingual teaching. For example, Colorado School of Mines (USA), The University of Queensland (Australia), etc. ② Inviting in. For the purpose of bilingual education construction, scholars from foreign universities are invited to give lectures at our university on a regular or irregular basis, and two kinds of methods are adopted: short-term lectures for undergraduate or graduate students and bilingual education teacher training, in order to improve teachers' foreign language skills. ③ Playing the role of part-time teachers. Three alumni working abroad were hired as adjunct professors to work continuously at our university for one to two months each year. Professional teachers can improve their business skills and English skills through the work of adjunct teachers and through exchanges. ④ Tapping internal potential and strengthening teacher training. Our university attaches great importance to the on-campus training of bilingual teaching faculty. In the past five years, our university has set up "bilingual teaching teacher training classes" every year. ⑤ Strengthening the teaching mode of interaction between research and teaching. We timely introduce advanced technology and cases of foreign mine ventilation safety into the classroom to expand and adjust the professional knowledge structure of students. We actively conduct seminars on teaching contents and teaching methods, absorb advanced teaching methods from abroad, and improve the teaching level of the faculty in English and Chinese in the process of teaching reform.

#### 4. The construction of teaching materials

We update in time and constantly improve bilingual content. According to the characteristics of the discipline, the teaching contents should be enriched according to the specific situation of domestic mine ventilation system and the latest technology development. The teaching materials (English-Chinese) or auxiliary teaching materials and exercise sets should be prepared according to the training objectives and teaching requirements. Case studies on optimization and modification of mine ventilation systems and other bilingual teaching materials have also been prepared. Students are encouraged to take the initiative to visit foreign mining websites. The auxiliary teaching materials are mainly selected from foreign professional English textbooks, periodicals, international conference collections, mining websites, etc. Such as proceedings of the North American/Ninth US Mine Ventilation Symposium (proceedings); Mining Engineering (American Mining Journal), Mining Weekly (South African Mining Weekly), Mining Journal (Canadian Mining Journal); <http://www.osha.gov/> (OSHA website); <http://www.msha.gov/> (US Mine Safety and Health Administration website), <http://mvseengineering.com/> (US Mine Ventilation Service website), etc.

#### 5. Teaching effectiveness evaluation

A post course's anonymous survey found that students feel the course enables them to gain English and expertise in a relaxed and enjoyable environment. The bilingual teaching not only makes the students gain a lot of professional knowledge, but also improves the students' professional English, which helps the students develop their vision and accumulate knowledge, and has a great effect on their overall development. The bilingual teaching can stimulate students' interest in learning English and well motivate them to learn the course and foreign language knowledge. The bilingual teaching is very helpful for students to master the application of English in practice. This survey also investigated the overall evaluation of the current "bilingual education" class. Those who are very satisfied account for 30.8%, those who are satisfied account for 52.4%, those who are average account for 14.5%, and those who are dissatisfied account for 2.3%.

Through the implementation of bilingual teaching in the first semester of 2021-2022 and of 2022-2023 in the safety engineering specialty, the final grade of students was improved from 80.2 to 90.2, and the teaching effect was more obvious. Through the CET4 and CET6 results of these two bilingual classes compared to the previous ones without bilingual education, the students' pass rates of CET4 and CET6 have increased by 20% and 15% respectively compared to the previous ones.

#### 6. Conclusions

Through the practice of bilingual teaching of the course Mine Ventilation and Air Conditioning, the following conclusions are obtained.

- (1) Establishing a correct teaching philosophy and clarifying teaching objectives are the keys to improve bilingual teaching in professional courses.
- (2) The stages of infiltration teaching and integration teaching were set according to the characteristics of the course and the specific situation of students; the good teaching results were achieved.
- (3) Strengthening the training of localized bilingual teaching faculty is an important way to solve the current shortage of teachers.
- (4) Providing various types of supporting materials of bilingual teaching can not only enable students to grasp foreign advanced scientific and technological information in a timely manner, but also greatly enrich the content of bilingual teaching, stimulate students' learning enthusiasm and improve their English application ability.

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# Discussion on the construction scheme of IOT application technology professional group training base under the background of “1 + X” certificate system

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**Abstract:** in view of the introduction of the 1+x certificate system pilot launched by the Ministry of education, under the background of the construction of high-level professional groups advocated by the state, how to build the training base of professional groups in higher vocational colleges, whether it can meet the daily training teaching, while taking into account the needs of talent training for the transformation and upgrading of local economy and industry, the improvement of professional social service ability, and the realization of the integration of industry and education, These are the puzzles faced by the construction of professional group training base. This paper takes the construction of high-level professional group of IOT application technology in Foshan Polytechnic as an example, and puts forward the construction ideas and contents of professional group training base, so as to provide high-quality teaching conditions and environment for professional group talent training.

**Key words:** “1+x” certificate; Professional group; Vocational skills; Job position

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## 1 Summary

In April, 2019, the Ministry of education, the national development and Reform Commission, the Ministry of Finance and the State Administration of market supervision jointly issued the pilot plan for the implementation of the system of “academic certificate + several vocational skill level certificates” in Colleges and universities, According to the plan, “combining academic certificates with vocational skill level certificates and exploring the implementation of the 1 + X certificate system is an important reform and deployment of the 20 items of vocational education, and also a major innovation. Pilot colleges and universities should promote the organic connection between” 1 “and” X “, further play the role of academic certificates, and consolidate the foundation for students’ sustainable development, Actively give play to the advantages of vocational skill level certificate in promoting talent training in Colleges and universities and implementing vocational skill level evaluation, organically integrate the certificate training content into the professional talent training program, and optimize the curriculum and teaching content.

The 1+x certificate system is a basic system for the construction of the national vocational education system. The implementation of the 1+x certificate system will boost the reform of vocational education towards a modular teaching mode of further innovation. The vocational skills training course launched in combination with the real needs of enterprises and the talent training plan of colleges and universities aims to help cultivate digital talents and effectively improve students’ employability and the quality of vocational education.

In the “1+x” certificate, “1” is the foundation, and “X” is the supplement, reinforcement and expansion of “1”. While learning the teaching content of the major (Group), students can understand the vocational skills courses in the fields similar to their major, which can broaden the field of employment and expand employment opportunities. The academic certificate and the vocational skill level certificate are

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