

# *Discussion on bilingual textbook construction for the introduction to traffic engineering*

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**Abstract:** Under the background of engineering education certification and education internationalization, bilingual teaching for professional courses is very important to improve students' international communication abilities and obtain international education certification in professional fields. The construction of bilingual textbooks is a prerequisite for bilingual teaching. This paper introduces the general requirements followed in the construction of bilingual textbooks, such as the idea of outcome-based education (OBE), the establishment of correct ideological and political ideas, a reasonable combination with online teaching resources, and innovative localization of original English textbooks. Based on the above principles, the chapters are rearranged in the bilingual textbook for the introduction to traffic engineering. According to the course characteristics of the introduction to traffic engineering, the way to implement the OBE concept, ideological and political education, and an open bilingual teaching system in the bilingual textbook construction are discussed. All these provide valuable references for the construction of bilingual textbooks for similar professional courses.

## 1. Introduction

Engineering education certification is an important basis for mutual recognition of international engineering education and engineer qualification. Under the background of engineering education certification and education internationalization, undergraduate students not only need to have high-level professional knowledge, but also need to have an international vision and a high level of professional foreign languages. An important way to obtain these abilities is the bilingual teaching for professional courses. Three curriculum objectives of bilingual professional courses are to transmit professional knowledge, improve professional English level and cultivate students' international vision.

In China, the bilingual teaching refers to a way of organizing teaching activities in both a foreign language and a native language, namely English and Chinese. Hence, the bilingual teaching is quite different from ordinary English teaching. Although English is used in whole or in part in the bilingual teaching, the core of bilingual teaching is the professional knowledge, and English is just a

means of transferring professional knowledge [1].

Bilingual textbooks or English textbooks are the prerequisite for bilingual teaching. Chinese textbooks cannot meet the requirements of bilingual teaching, while original English textbooks significantly increase the difficulty of bilingual teaching in China. To achieve a better teaching result in bilingual teaching, it is very important to strengthen the construction of bilingual textbooks.

## **2. General requirements during bilingual textbook construction**

Textbooks are the basis of course teaching, the basic guidance for students' learning, and the most basic elements of teaching activities. Textbooks play a key role in improving the level of education and teaching and the quality of personnel training. High-quality teaching materials are crucial to high-level teaching quality. Textbooks are also an important carrier of professional knowledge and an important means of teaching reform. The construction of teaching materials in colleges and universities is an important starting point for the connotative development of higher education, and a basic and strategic project related to the future. The construction of bilingual textbook is a complex and challenging work, which is not accomplished overnight.

### **2.1. Outcome-based education**

The core concept of engineering education accreditation is outcome-based education (OBE), which pays attention to students' learning outcomes [2]. The OBE education concept is a goal-oriented, student-oriented, and reverse thinking approach to the construction of a curriculum system. The OBE concept is also known as results-oriented education, ability-oriented education, goal-oriented education, or demand-oriented education. According to the OBE concept, all teaching activities must take the students' expected graduation ability requirements as the ultimate goal, namely student-centered teaching, which puts higher demands on teachers, textbooks, and curriculums. To promote the student-centered teaching, the guiding role of teachers and the subject position of students should be fully recognized during the whole teaching activities, including the textbook construction process.

### **2.2. Ideological and political education**

According to the Guidance Outline for Ideological and Political Construction in Colleges and Universities, ideological and political education should be implemented in all aspects of curriculum construction and teaching, including the textbook construction. Textbook construction should adhere to the correct orientation of education. The ideological and political education should be embedded in the textbook to promote the organic integration of knowledge impartation, ability cultivation, and value guidance, and achieve a better effect of collaborative education. Therefore, the ideological and political education should be considered in the whole process of textbook construction, such as the China's achievements in transportation construction.

### **2.3. New teaching mode**

Classroom teaching is the most important part of bilingual teaching. English PPTs, English exams, and English homework are three important means to improve students' professional English proficiency. In teaching based on bilingual textbooks, English should be written on the blackboard as much as possible, and explanations should be made in a comprehensive manner using both English and Chinese. Bilingual teaching should be flexibly adjusted based on course content and student feedback.

With the further reform of teaching informatization, new teaching modes, such as massive open online courses (MOOC), blending learning, and flipped classroom, have been gradually adopted in colleges and universities. New teaching modes bring new requirements for textbooks and promote the reform and construction of traditional textbooks. New teaching modes provides an effective way to achieve better teaching results within a limited time. With the built-in QR code in the textbook, students can obtain auxiliary teaching resources, such as videos or documentation, by scanning the code. This method facilitates students' autonomous learning in advance or self-study before class.

## **2.4. Innovative localization of original English textbooks**

With the development of education internationalization, bilingual courses offered by colleges and universities are gradually increasing. Some bilingual courses directly use the original English textbooks. But the authors of the original English textbooks lack understanding of China, so their textbooks are often out of touch with China's reality. An ideal bilingual textbook should be innovatively localized on the basis of originality and content creation in accordance with the syllabus and teaching objectives in China [3]. Moreover, original English textbooks are prone to deviations in students' understanding. Therefore, English expressions in bilingual textbooks should avoid ambiguity as much as possible.

## **3. Content organization of bilingual textbook Introduction to Traffic Engineering**

Introduction to traffic engineering is a course that closely combines theory and practice with dual attributes of natural and social sciences. It is a core course of traffic engineering major and a professional course in road and bridge engineering direction of civil engineering major. It is an introduction course of traffic engineering discipline, and its teaching content focuses on road traffic, studying the relationship between road users, vehicles, roadways, and the environment in road traffic system, and exploring the basic laws and applications of road traffic phenomena. Through the study of introduction to traffic engineering, students can master the basic concepts, basic theories, and basic methods of traffic engineering discipline, and have the ability to solve complex problems in traffic engineering [4].

For the bilingual textbooks used in professional courses, the primary task is to transfer professional knowledge. Thus, the content of bilingual textbook should keep up with the development of the discipline to reflect the results of advanced scientific research at home and abroad [5]. According to original English textbooks, such as Traffic Engineering (fifth edition) published by Pearson Education and Traffic Engineering Handbook (seventh edition) published by the Institute of Transportation Engineers (ITE), and Chinese textbooks, such as Traffic Engineering (third edition) and Introduction to Traffic Engineering (fifth edition) published by China Communication Press, the main content of self-compiled bilingual textbook introduction to traffic engineering are determined after innovative localization of original English textbooks. The contents are as follows:

Chapter 1, the Introduction, presents an overview of traffic engineering discipline, such as the concept, characteristics, objectives, scopes, challenges, development status and trends of traffic engineering in China.

Chapter 2, the Road traffic system, gives a detailed description of the four key components of road traffic system, including road users, vehicles, roadways, and road environment.

Chapter 3, the Traffic stream characteristics, presents the parameters to characterize a road traffic stream, such as traffic volume, speed, and density, and their fundamental relationships.

Chapter 4, the Traffic study, gives a brief description of traffic studies including traffic volume study, spot speed study, travel time study, and delay study.

Chapter 5, the Traffic flow theory, briefly gives some fundamental theories for traffic flow analysis, including statistical distributions, queuing theory, car following model, and shockwave theory.

Chapter 6, the Highway capacity analysis, provides fundamentals of the analytical methodology and logic procedure for the estimation of capacity of freeway and multilane highway.

Chapter 7, the Traffic management and control, presents an overview of traffic management and control, including traffic management, traffic control devices, and intersection control.

Chapter 8, the Transportation planning, briefly describes the transportation planning process, the relationship between transportation and land use, and four-step travel demand forecasting.

Chapter 9, the Parking, briefly discusses the types of parking facilities, parking demand, parking study, and parking facility design.

Chapter 10, the Traffic safety, presents a very general overview of traffic safety, including factors involved in highway crashes, safety management process, and approaches to highway safety.

Chapter 11, the intelligent transportation system, gives an overview of intelligent transportation system, including supporting technologies, application, and challenges.

## **4. Thoughts on bilingual textbook construction of Introduction to Traffic Engineering**

### **4.1. Implementation of OBE concept**

Based on the OBE concept of engineering education accreditation, curriculum objectives need to be designed by the graduation requirements and expected teaching result to reflect the role of curriculum in professional talent cultivation program. To implement the OBE concept, teachers should stimulate and cultivate students' autonomous learning ability to promote the transformation from teacher-centered teaching to student-centered learning. Some teaching methods, such as heuristic and guided teaching, case teaching, discussion teaching, and other teaching methods, should be comprehensively used to form a good interactive teaching environment. During the teaching, current traffic problems can be introduced to establish scenarios, and solutions to these problems are used to cultivate students' innovative thinking abilities and guide them to learn independently.

Bilingual textbook construction should follow the OBE concept. Therefore, bilingual textbook construction should be developed in a student-centered direction and highlight the cultivation of engineering practice ability and innovation ability [6]. Moreover, bilingual textbooks should stimulate students' learning interest to enhance their autonomous learning ability.

The design of bilingual textbook should fully consider the individual differences of each student and ensure that each student can achieve the expected learning outcomes. Teachers should not only provide all students with the same learning opportunities at the same time in the same way, but also respond to students' personalized needs in a more flexible way to give students an opportunity to demonstrate their learning achievements.

### **4.2. Implied ideological and political elements**

According to the basic requirements of ideological and political education, curriculum objectives should also reflect the function of ideological guiding and value shaping to realize the guidance of students' thoughts and values. Combined with the OBE concept, the bilingual teaching of the introduction to traffic engineering should establish a trinity objectives of knowledge imparting, ability training, and value shaping. Moreover, the ideological and political education should be deeply integrated into the teaching of related professional content in an implicit way to realize the organic integration of knowledge impartation, ability cultivation, and value guidance and achieve

the synergistic education effect [7].

Based on China's conditions, the ideological and political elements and moral connotations contained in the professional courses can be explored from cultural confidence [8], road confidence, social responsibility, humanistic feelings, legal concepts, craftsmanship spirit, etc. For example, in the Chapter 1, namely the Introduction, Chinese wisdom and China's achievements are highlighted through the transportation infrastructure construction and transport power to enhance students' confidence in China's path and culture.

The Belt and Road promoted by China has significantly improved the efficiency of international logistics and has become a vital economic artery. The Belt and Road traffic connectivity effect is increasingly prominent, injecting new impetus into economic and trade exchanges between China, other countries and regions along the Belt and Road, and achieving mutually beneficial and win-win development for all countries. These newly China's achievements should be introduced to students in bilingual teaching to enable them to recognize the positive role of China in the construction of the world economy.

### **4.3. Building an open bilingual teaching system**

Nowadays, colleges and universities have generally organized online and offline mixed teaching modes with the help of an online network teaching platform. The development of information technology has brought revolutionary changes to textbook construction and greatly enriched the presentation form of textbooks. It is difficult for traditional textbooks to meet the needs of new teaching modes alone, so new auxiliary teaching forms emerge to realize the interaction between online and offline and integrate teaching materials and online teaching resources. New forms of teaching materials and teaching methods are not only carriers of professional knowledge, but also an open teaching system in which new materials can be continuously added.

The open bilingual teaching system is based on the teaching material and assisted by the online teaching platform. Hence, the teaching content is presented in a more rich, vivid, and intuitive form. In the open bilingual teaching system, the professional knowledge of the introduction to traffic engineering can be presented in both Chinese and English to ease the students' bilingual learning and enhance students' confidence, and the complementing of offline and online learning can stimulate students' interest in learning. Auxiliary teaching materials, such as videos, pictures, assignments, etc., can be presented in their native language. Some original English textbooks related to traffic engineering can also be used as supplementary materials. For paper bilingual textbooks, the professional knowledge can be given in the English version, and some terms can be annotated in Chinese.

## **5. Conclusions**

As a prerequisite for bilingual teaching, the localization of original English textbooks makes the content of the bilingual textbooks more closely related to the current situation of traffic engineering in China, which gives the bilingual textbooks a higher practical value and greater applicability, making them easier to be accepted by Chinese students. With the help of reasonably organized online teaching materials, students' in-depth understanding of professional knowledge is easier to achieve. Ideological and political education, like the thread that links the pearls, should be implicitly included in the whole textbook. By introducing the hard work and outstanding achievements of domestic engineers in traffic engineering construction, students' interest in learning will be established. Another thread that runs through the entire textbook is the student-centered concept, which provides a rational way to organize the content of the textbook.

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