Opportunities and Challenges in Developing All-English Teaching of Materials Major in Chinese Universities

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Abstract—The purpose of this study is to analyze the problems in all-English teaching in Chinese universities and to propose promising viewpoints to contribute to improvement in this field. Correspondingly, this paper introduces the general situation in the development of all-English teaching courses specifically in materials major at present. Based on personal experience, the authors discuss the development of all-English teaching courses in China from various aspects, including the comparison of textbooks in China and abroad, the design of teaching content, English ability of both teachers and students, students’ learning effect and their teaching feedback. The authors propose that it is inappropriate to discuss the construction of an independent all-English course. It is necessary to form a system of all-English teaching courses according to the major specialty before systematically cultivate students’ abilities toward professional English.

Keywords: English teaching, materials major, all-English curriculum system

I. INTRODUCTION

In the 21st century, the global economy tends to move forward in a coordinated way, in which new strategic industries, such as materials and energy, are developing rapidly and growing in scale. It is estimated that by 2020, the output value of new materials relating to industries will reach 15 trillion yuan, equivalent to 20% of GDP of China in 2016[1]. Therefore, the new materials industry is the focus of global economic integration and its international development is greatly significant. Under such a circumstance, universities in China are bound to carry out international education. University of Shanghai for Science and Technology (USST) has carried out a series of programs to achieve the international integration of talent cultivation, including international cooperation and exchanges of foreign students with famous overseas universities in the School of Materials, such as Florida State University in the United States and Baylor University in Germany. The two major disciplines in the School of Materials, USST, have passed international engineering certification evaluation and are in line with international standards. At the same time, the School of Materials has developed a number of all-English teaching courses with advanced teaching ideas, reasonable teaching methods, meticulous and optimized contents and aiming at the hot spots of materials nowadays by following the construction purpose of the top quality all-English teaching course in Shanghai universities, therefore improving the professional teaching quality of the School of Materials and serving the cultivation of internationalized talents. Specifically, the course of Materials Science and Engineering is the only all-English-language course planned and constructed by Shanghai Education Commission during the 12th Five-Year-Plan period [1].

After studying and teaching in American universities for many years, the authors compare the similarities and differences of teaching in Chinese and overseas universities according to their own experience accumulation, and propose several suggestions for the development of all-English teaching courses for materials science and related specialties.

II. DESCRIPTION OF TEACHING METHOD DESIGN

A. Advantages of all-English Courses

It is necessary to teach all-English courses with all-English textbooks in order to implement the all-English teaching. The basic curriculum in American universities has a prominent feature that most courses have its corresponding classical textbooks, which probably have experienced several revisions to adapt to contemporary students’ learning ability [2]. However, in China, significantly different textbooks are selected by domestic colleges and universities. There is not a uniform regulation, nor can they be formed systematically and perfectly developed into textbooks to fully suit China’s national conditions with the times. Even if some classical textbooks ever existed, such as both Chinese and English versions of Major American Universities Ph.D. Qualifying Questions and Solutions series, which were popular in both Chinese and American universities, they were gradually abandoned by the contemporary curriculum because of its lack of updated reprint. Specifically, there are no classical textbooks of materials science and Engineering in China.

According to the specialty of materials discipline, appropriate foreign excellent textbooks can be chosen systematically for various levels of all-English teaching courses.
Such textbooks have been published for many years and are still novel and advanced. The contents of such textbooks are fruitful and easy to be accepted by students. For example, *materials science and engineering: An introduction*, which is compiled by William D. Callister, Jr., has been updated to the ninth edition in 2013; *Introduction to Polymer Science and Technology*, compiled by Mustafa Akay and others, is also the landmark introductory textbook in polymer materials. The contents of these textbooks are not only authoritative and representative, but also clear and easy to understand, which is in line with students' understanding and learning methods. The advantages of these textbooks are beyond the reach of many domestic textbooks in China. The use of these authoritative textbooks can make up the deficiencies in the design of professional courses in China and improve the quality of all-English teaching courses as a whole [3].

Produced by excellent production technology with fewer mistakes in the content, most of the original English version textbooks are hard-skinned, which can significantly improve the reading comprehension effect for undergraduates. However, such original version textbooks are expensive, mostly over $100, which are more than the average domestic students can afford in China. Fortunately, in recent years, a large number of photocopied textbooks with copyright have been introduced to China, using cheap paper for black-and-white printing. Although the reading experience has been greatly reduced, they can basically meet the needs of all-English teaching courses, especially for the materials major. In addition, teachers who teach all-English courses in China can adapt and abbreviate these classical textbooks appropriately in order to gain a wide range of advantages and make English-version textbooks to serve Chinese undergraduates better.

**B. Problems of All-English Teaching Courses**

The main battlefield for the development of the all-English teaching courses is an on-site class. Teachers have to pass on knowledge in the course through English oral communication. This requires that teachers have both rich professional knowledge and excellent English oral ability. Most of the teachers in China grew up in an environment of Chinglish education in domestic universities. Not only do they have a strong Chinese oral accent, but more seriously, they are not intended to teach English courses using English thinking habits, therefore often failing to achieve the expected results of offering all-English courses. As a result, such all-English courses cannot increase the international vision of the undergraduates in the materials major. Even worse, they will produce opposite effects against the original purpose and weak undergraduates' English-study interest and capability. In such a situation, undergraduates generally cannot understand the professional knowledge in the course. They even can misunderstand the content due to the teachers' Chinglish problems. In order to overcome such common problems in Shanghai universities in China, the School of Materials in USST requires that most of the teachers offering all-English courses have overseas learning or working experience, who can employ the mode of teaching in English thinking better with fluent spoken English in the materials discipline [4].

At present, the all-English courses mainly focus on the undergraduate programs in the full-time universities in China. Being lack of the bilingual teaching system in primary and secondary schools in China, English learning among Chinese students is significantly influenced by their native language of Chinese, which correspondingly results in a generally low level of English listening and speaking among undergraduate students in Chinese universities. Many undergraduate students in USST actually do not satisfy the requirements to guarantee that they can successfully complete all-English teaching courses when they participate in. Most of them are studying and thinking by following a traditional Chinese way. In order to solve this problem, it is necessary to introduce the differences of thinking between the languages of English and Chinese at the beginning of an all-English course. This can definitely guide students to understand the essence of the all-English course and improve interests and ability of undergraduates in learning professional English. Currently, the teaching mode of all-English courses is still in the exploratory stage. Various colleges and universities in China should set distinguishing all-English teaching requirements and teaching details to satisfy their own special characteristics.

**C. Design of Teaching Content**

Although each university aims to cultivate all its undergraduates to be international talents, this is actually impossible to achieve. Generally, there are great differences in each undergraduate's knowledge reservoir when they start the study in a university. Furthermore, materials science is different from mathematics, physics and other fundamental disciplines. Few freshmen can fully understand what this interdisciplinary field means. It is necessary for newly-enrolled undergraduates in materials major to complete the required fundamental courses to achieve the ability toward advanced major courses according to the characteristics of each University. At present, only some professional courses in materials science are suitable for all-English teaching in USST. It is still necessary to teach fundamental courses using Chinese to ensure that undergraduates in USST can lay a good foundation in materials major. Furthermore, an all-English course can be divided into two classes to address the same material specialty: one ordinary class and one advanced class. The design of teaching content is obviously different between the two classes, as well as the course credits. The students who can enter the advanced class are determined by a comprehensive evaluation of their scores obtained from the fundament courses and the fourth level of College English Test (CET-4). After the Students complete their study in the ordinary class, they still need to finish more study in the advanced class. This not only conforms to the concept of teaching students in accordance with their aptitude in Chinese education, but also enables undergraduates to grow healthily into talents with different ideals, objectives and abilities necessary for the society. Actually, there are also some practical problems in such a method to classify the same all-English teaching course to two levels. If most students are merely satisfied to earn credits easily and do not want to enroll the advanced class, which may result in a smaller number of students to register the advanced class than the required minimum to open the class. Therefore, the curriculum design
of advanced classes should be enriched in many ways besides the teacher's lecture in class, for instance, required credits for awards. On the other hand, teachers can guide students to conduct project researches in groups, discuss and compete in English, enrich the teaching content by using multimedia and multi-platform, and jump out of the limitation that English is the only feature of the all-English course. All these methods will have great significance and influence on the cultivation of undergraduates' learning capability. Of course, the design of this kind of curriculum content needs an exploratory process to overcome the embarrassing dilemma that students may choose the all-English course without studying in the class.

In order to be accepted and mastered by students, the all-English teaching process can be divided into several stages. Different course contents and teaching methods are designed and planned. The all-English course will start with new professional vocabulary learning, and followed by the major theoretical part to enable students to master the professional knowledge. The students' English ability also can be improved by learning the preceding chapters and mastering the necessary vocabulary for all-English materials major. Then, the follow-up part of the all-English course can proceed smoothly. In this way, an all-English course can achieve a successful result.

D. Teaching Effect and Information Feedback

As mentioned in the former part, the all-English teaching is in an exploratory stage at present. Most of the proposed schemes and objectives have not been tested by practice. In order to understand its effect, it is necessary to evaluate the teaching result of the course. Questionnaires for the course can be designed and sent to students, including students' expectations for the course, their pre-knowledge reserve at the beginning of the course, students' mastery of knowledge and the improvement of their expectations for the course at the end of the course, as well as the improvement of English level, the understanding of textbooks and suggestions for English teaching. Teachers also can evaluate students' achievements in learning the all-English course from the aspects of professional knowledge, comprehensive English proficiency, spoken English, English listening, English writing, professional vocabulary and so on.

It is important to improve students' learning enthusiasm through curriculum assessments [1]. The students' curriculum achievements include the scores of daily attendance, final examinations and the scores of the enthusiasm of a student in the class, for instance, the frequency to answer teacher's questions. This can avoid the bad phenomena of students' passive learning and quick review just before each examination. This also can really integrate the students into the teaching of all-English courses, fully arouse the students' interest in learning and mobilize their enthusiasm for learning. By referring to foreign teaching models to increase the proportion of the paper/project in the course, students can choose topics freely according to their interests. Through multiple teaching modes, students can improve not only their English understanding and communication ability, but also their professional ability and problem solving ability, which can kill two birds with one stone.

Finally, the current all-English courses can be improved to open up an effective way of English teaching through the analysis of the final scores of students and various results obtained by statistics in this course.

III. CONCLUSIONS

Designing all-English courses is an exploratory progress of teaching and a challenging reform in Chinese universities. It is not properly to simply discuss the construction of an all-English course. Instead, a system of all-English courses should be built according to the specialty of the major. As such, students can systematically master various kinds of abilities of professional English. The strong support from universities and higher education departments in Chinese government are important to develop this project. Only in this way, undergraduate students can truly master what they have learned and become international talents in materials science.

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