

Practice and Research on Chinese-English Bilingual Teaching of “Introduction to Materials Science”

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Abstract

Bilingual education was applied to serve different goals around the world in the past years. A lot of achievements have been obtained, however, there still exist some problems need to be solved. To further enrich our understanding for effectively bilingual education in the classroom, a systematic research on bilingual teaching of “introduction to materials science” was carried out. The results indicated that appropriate teaching methods play an important effect on inspiring the students’ study enthusiasm. Different teaching methods should be applied in the classroom according to the teaching content and the students’ knowledge.

Keywords: Bilingual Teaching; Introduction to Materials Science; Practice and Research

Introduction

Bilingual education implies the use of more than one language for teaching and learning curriculum subjects. A lot of researches indicated that bilingual teaching suffer no adverse effects in their mastery of the majority language as a result of spending significant instructional time through the minority language. Moreover, some results also showed that bilingual education may raise attainment with any degree of confidence for the students who

can use the first language skillfully [1]. In recent years, this kind of education was applied to serve different educational or social goals around the world.

In the early of twentieth century, to keep up with the international educational standards and cultivate talents who participate effectively in international cooperation and competition, Chinese-English bilingual education was carried out in China in many schools. However, there still exist some problems of bilingual education to be solved. For instance, how can we deliver the desired outcome of bilingual teaching effectively in the classroom? How to promote the students’ study enthusiasm? In order to throw light on these questions and enrich our understanding of effective bilingual education, Chinese-English bilingual teaching of “Introduction to Materials Science” was carried out from 2009 to 2012. There are 332 college students from Materials Science and Engineering and Materials Chemistry in East China Institute of Technology from grade 2008 to grade 2011 took part in the bilingual teaching. These students have been studying English for at least 8 years. Most of them can read the general works written in English fluently. According to the research results of Collier etc. [2], if the learner’s level of language 2 (L2) can reach to certain threshold, the bilingual education can have positive effect on their cognitive/academic language proficiency. So

the bilingual education for these students has the potential positive effect on improving their ability. The main objective of this practice and research is “how” we can improve their ability. During the practice, we established the teaching objective at first, and then determined the teaching contents, selected suitable textbook, teaching molds, teaching methods and evaluation methods. The effects of the factors above on the education were investigated.

1. Teaching objectives

The objective of bilingual teaching is to both make students study professional knowledge, and develop skills of English listening, speaking, reading, writing, studying and thinking by osmosis, which leads to the development of professional knowledge and English abilities. Therefore, the objectives of “Introduction to Materials Science” bilingual teaching are as follows:

The basic objective is acquiring the same knowledge and abilities as Chinese teaching such as: The students should master the general concepts, classification, structure, properties and performances of general materials including ceramics, metallic materials, polymeric materials, composite materials and so on. The relationships between the materials science and other subjects should also be mastered. The student should know the status of the materials in the national economy and have adequate understanding about the substances described above. They should also know something about the research tendency and development tendency of the materials science and technology.

While as a bilingual teaching, language leaning is the other direct objective. So the second objective is acquiring the abilities of gaining the knowledge by using English to think, and the abilities of trans-

forming freely between two languages according to the communication object and circumstance.

2. Teaching contents

Teaching contents of “Introduction to Materials Science” can be divided into three parts. The first part is basic principle of materials science (structure of crystal, phase diagram etc.), the second part is introduction of typical materials, such as metallic materials, polymeric materials, etc, the final part is introduction to some advanced materials.

3. Textbooks

English and Chinese are two completely different language and they have different mode of thinking. The selection of textbook for bilingual education is very important for a successful bilingual teaching. There are some English textbooks for “Introduction to Materials Science” edited by Chinese people. However, the content or the English expression method of them can not fully meet the requirements for our teaching. Some textbook is more suitable for specialized English teaching. In terms of teaching objective, the book-“Foundation of Materials Science and Engineering” edited by Willian F. Smith and Javal Had Hashemi was chosen as the textbook. Most of the students agreed that the original foreign textbook can afford them to “authentic” major English. However, students using textbook written in English encountered some difficulties. So some auxiliary references were provided to them and the student was required to prepare lessons before class. It should be noted that we don’t explain the new words meaning at the beginning of the class, only labeled it in Power-point (PPT). Otherwise the class may turn into English language teaching class.

4. Education molds and teaching methods

4.1 Education molds

There are several molds for bilingual education. Immersion, transition and maintenance are the most common three molds. For Chinese–English bilingual teaching, in immersion mold, 100% contents are told in English. It can be subdivided to “Early total immersion”, “Early partial immersion” (Intermediate and late immersion) and “two way immersion” etc. While in the second mold-transition mold education, the target language (L2) was taught step by step. While the objective of the third mold is developing both the target language and native language, which means both English and Chinese were developed in Chinese-English bilingual teaching. These three molds reflect the time division of language applied in the classroom. Some researcher suggested that the English usage rate should reach 100% in a curriculum, while others suggest English should be used below 100% such as 60%. In our opinion, the proportion can be varied according to different content. For example, the proportion can be as low as 30% for complex contents such as the structure of the materials, while it can rise to higher for introduction of general properties of some materials. However, we do not agree that the same content should be told in both languages which may deteriorate the efficiency.

4.2 Teaching methods

Different teaching methods were used in the curriculum teaching according to different teaching contents and the individual differences among students, which implied relevant and visible training values to the students.

Among these methods, the lecture method was often used in our classroom which can provide large amount of information in the class and the teacher felt

it is easy to carry out the teaching by this method. However, just as many researches indicated in other practices, it appeared that the students get boring in the class when the oral-teaching time was too long, because this kind of method is usually one-way communication and allows for little student participation. Modified and other teaching methods such as slide demonstration, catechism method, demonstration method, classroom talk and heuristic method were also applied in this education.

During the slide demonstration, multimedia mediums as power point (PPT) etc. were carefully prepared by selecting suitable teaching materials. Graph, text, sound and image of the curriculum information were integrated in the PPT which inspired the enthusiasm of the students and improved the learning efficiency. Furthermore, the writing and drawing amount of teachers on the blackboard reduced greatly. The teachers can spend more time for lectures, discussion and deliver more quality information in the classroom with same teaching hours compared with traditional means [3]. The research results of Douglas B. Clark [4] suggested that significant benefits for providing English language learner (ELL) students with accesses to content and supports in both local language and English as opposed to the English-only format. Based on their research, in the PPT, some difficult special English words were given both in English and Chinese. The students reflected that this approach can reduce the difficulty of bilingual learning and help them to master the basic knowledge. In order to prevent PPT be another blackboard which may has inferior effect to the direct lecture, in the PPT, we try to use the limited words to express more information and integrate more graphs, images and other medium in it. The class is student-centered all along.

During the teaching process, some concepts were not given directly, in general, some examples related to it we would introduce to the students and then let them to define the concept themselves which can help them to master the concept. However, for some concepts, there are some differences between the original language textbook and general concept in China. In these conditions, lecture method was applied in the classroom which can make the definition described more clearly.

5. Evaluation methods

The measurement of educational productivity is often expressed in terms of time efficiency (based on converted test scores). It was evaluated by usual performances and final examination. Usual performances include assignment, classroom test, foreign language communication etc. Usual performance accounts for 30% in evaluation while that of the final examination accounts for 70%. In the examination, the paper was given in English and the answer can be given in English and Chinese.

6. Conclusions

The systematic research on bilingual teaching of "Introduction to Materials Science" indicated that appropriate teaching methods play an important effect on inspiring the students' enthusiasm. Different teaching methods should be applied in the classroom according to the teaching content and the students' knowledge. After the bilingual teaching of "Introduction to Materials Science", the passing rate of College English Test (CET) 4 of these students increased. Although there is not absolute cause-and-effect relationship between them, because there are many other possible variable, more than 72% students participated the teaching expressed they

hope some other courses can be taught in this method. However, there are still few students can not keep up with the teaching schedule in the classroom. So certain quantitative evaluation methods need to be established by which the student suitable for bilingual teaching can be chosen.

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