

The Exploration of the Bilingual Teaching Model of Engineering Mechanics in Agricultural Universities

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Abstract—Based on the features of bilingual class of Engineering Mechanics and the situation of students in agricultural universities, the bilingual teaching research of Engineering Mechanics among students in three years, and combined with the reality demonstrated from teaching practice and survey charts, with detailed analysis in the aspects of selected textbook, teaching content, teaching methods and examining forms, this paper explores a teaching method which fits most the students in agricultural universities, wishing to arouse students' interests in bilingual class, to improve the bilingual teaching quality of Engineering Mechanics and to enhance students' ability in reading foreign articles related to Engineering Mechanics and the use of English to express further, thus achieving the goal of improving the overall quality of the students.

Keywords—Engineering Mechanics; Bilingual teaching; Agricultural universities

I. INTRODUCTION

Engineering Mechanics plays an important role in promoting talents in engineering majors (such as Water Project, Civil Engineering, Mechanic Engineering, Traffic Engineering, Fire Fighting Engineering, Forestry Engineering, and so on) in agricultural university. As one of the basic major lessons in normal engineering majors, Engineering Mechanics mainly studies the basic rules in the field of engineering, and it is a theoretic, technical and basic science which is well connected to practical engineering technology. Its conclusions are widely used in various engineering technologies. Where there is a technical problem, there is a mechanical problem. In this case, it is the base of solving practical engineering problem. On one hand, Engineering Mechanics requires students to gain basic knowledge, theory and method of Engineering Mechanics, to form a strong base for further major study, on the other hand, it needs to develop the capabilities of abstract thinking, logical thinking, analyzing and solving problems of students. Whether mastering Engineering Mechanics directly matters the receiving capability and comprehension of the major knowledge of students major in engineering. How to inspire the learning interest of students and improve the teaching quality of Engineering Mechanics lessons is the main point which educators from the universities throughout the country keep thinking and exploring. With the unstoppable conclusion of teaching experience, practice of method, revolution of textbooks and so on, colleagues from different universities of the country, have made attractive teaching and study effect in

the aspects of teaching method, writing textbooks, theory of education and so on, which push towards the teaching of engineering mechanic [1-5].

II. THE BACKGROUND OF BILINGUAL TEACHING LESSONS OF ENGINEERING MECHANICS

The ministry of education specifically points out that the undergraduate education in universities should manage to use proper foreign English textbook and use English in public and major lessons teaching in [2001] 4th Some Suggestions about Improving the Teaching Quality in Undergraduate of Universities. At the same time, the ministry of education has made quantization rules of examination about the bilingual teaching in universities. In this situation, every university publishes the encouragement policy of bilingual teaching. Trying bilingual teaching has become an important part of education evolution.

The bilingual teaching in Engineering Mechanics is benefit to the improvement the quality of students. To make Mechanic international and take part in international communication, there is no doubt that we need to learn English textbook, which is able to open up the horizon of students, promoting students' motivation and initiative in learning mechanic. Bilingual teaching greatly broadens the application of English in the field of science, and eliminates the gap between public English study and major application. It develops the multiple abilities of students' listening, speaking, reading and writing, and it also improves students' ability of reading foreign articles and using English to express and think, becoming very significant.

III. THE PRESENT SITUATION OF BILINGUAL TEACHING IN ENGINEERING MECHANICS

A. *The Situation of Teaching Content, Teaching Method and Studying Hours*

According to the requirements of the Engineering Mechanics course, the teaching contents include: most of the rigid body mechanics and material mechanics (axial pull, deformation, bending, deformation, bending stress, stress state and strength theory, combined deformation and compression bar stability), which is based on the bilingual specialty of water engineering bilingual and agricultural water conservancy project of Inner Mongolia Agricultural University. Teaching hours for 48 hours of teaching plus 8 hours of test, and non-bilingual teaching professional is the same. In fact, in the same school hours, using bilingual teaching to teach the same teaching content is difficult to guarantee the quality of teaching.

According to this situation, different universities for the "engineering mechanics" bilingual course teaching methods have done some reform attempts, hoping to find a teaching effect which is better and easy to understand the teaching methods. Some institutions use the selected part of the content for English teaching, the other for the Chinese teaching; some institutions using multimedia teaching courseware in English, teachers teach in Chinese; some other use Chinese to teach, selecting little part of the lectures for foreign experts and other ways.

B. *The Situation of Choosing Textbooks*

Self-study in students' process of learning is dominant; a good textbook can enrich the knowledge of students, but also to stimulate students' interest in learning. Bilingual professional teaching material selection is particularly important. In addition to taking into account the comprehension of students, it is also combined with the characteristics of engineering mechanics courses. Some schools chose Engineering Mechanics by Andrew Pytel. Jaan Kiusalass and James M Gere's Mechanics of Material foreign language textbook [4-6]. Our school chose the Chinese version of the Engineering Mechanics textbook published by Chinese Water Conservancy and Hydropower Press and some parts of the English version of Engineering Mechanics STATICS part.

C. *THE WAY OF Judgment*

The purpose of the course assessment is to measure the student's learning situation and the teaching effect of a means. At present, the Engineering Mechanics course examination is closed book examination mainly. The contents of the questions are in two forms: pure Chinese questions and bilingual questions. The poll of students and the status of answering papers demonstrate that the Chinese questions are easier to answer compared with English ones. One of the main reasons is that some students cannot understand the English part of the content, which ultimately leads to the examination that does not reflect the real situation of student learning, so that the students cannot understand the situation. Students feel that English is a stumbling block.

IV. THE EXPLORATION OF BILINGUAL TEACHING OF ENGINEERING MECHANICS

For a variety of reasons, most students in agricultural colleges are relatively weak in English. For the bilingual major, the school has a great tendency in general English teaching, hoping that through the teachers, teaching methods, teaching facilities and other hardware and software facilities to help students improve their English level. However, many students do not consciously study English after finishing the normal English learning in the first and second year in University. Many students cannot pass the national regulations of the CET4 English examinations, failing to meet the undergraduate requirements of the state, let alone flexible application of English. Therefore, in the Engineering Mechanics bilingual teaching, on the one hand, it's difficult for students to accurately understand the original English textbook content of professional knowledge; on the other hand, if teachers completely use of English in teaching, it's difficult for students to concentrate on listening to the teacher's course contents. After several years of teaching research and feedback of student learning, it is an impact of agricultural Engineering Mechanics bilingual teaching quality which cannot be ignored. In 2016, we selected the three years (2013, 2014 and 2015) Engineering Mechanics bilingual students, and conducted a questionnaire survey and discussion. Through the analysis and discussion of the Bilingual Teaching Questionnaire of the Engineering Mechanics (hereinafter referred to as "questionnaires"), we have explored the following aspects in the teaching process based on various factors:

A. *The Textbook Choices*

First, select Chinese Engineering Mechanics teaching materials for agricultural colleges and universities which set up bilingual teaching professional, then try to use the original English textbooks close to the selected Chinese textbook system [4-6]. Combined with the advantages and disadvantages of the original English textbooks, and the domestic Engineering Mechanics course syllabus as the main line, we increase or decrease the appropriate part. For instance, as foreign language teaching materials, engineering features are prominent, practice is large and explain is refining. We try to carry forward the original English engineering features of the teaching materials, with the appropriate reduction of part of the exercises. In addition, we can also combine the professional characteristics, self-compiled part of the auxiliary materials to help students understand the English textbooks in the grammar, vocabulary and the long sentences, formulas and other expression characteristics in English.

B. *The Aspects of Teaching Content and Method*

Combined with Engineering Mechanics syllabus requirements of the agricultural engineering of agricultural water conservancy engineering and water engineering and professional follow-up courses, the appropriate bilingual professional Engineering Mechanics teaching content can be partially deleted, such as space force, deformation, bending deformation calculation and the three-way stress state and generalized Hooke's law, so that with the premise unchanged, the subject content is finer, in order to help students develop a good foundation of mechanics, mastering a solid Engineering Mechanics in basic theory, the basic method and the basic idea.

From the perspective of teaching methods, bilingual teaching is suitable for multimedia-assisted progressive teaching. Multimedia teaching has features like large amount of information, diverse content, focused and high teaching efficiency. In the process of bilingual teaching of Engineering Mechanics, the basic concept, the basic theory and the main content are made into the multimedia courseware completely in English. Using Chinese annotation in the part which is difficult to understand or the part which has uncommon words, helps students understand the teaching content in a timely manner. On the other hand, the use of multimedia technology illustrations, animation simulation of four basic deformation of the bar in the deformation process of the characteristics and deformation characteristics, help students understand the basic concept of deformation and identification methods, through the intuitive observation, guiding students to think, analyze, and summarize some engineering laws, and gradually develop their analytical thinking of mechanical thinking and ability to solve problems. During classroom teaching, to avoid the traditional teaching of the "teacher" as the main teaching methods, bilingual teaching focus on "interactive" teaching. Bilingual teachers need to have a certain degree of control of the classroom, the ability to organize the classroom. Heuristic questions and the appropriate classroom discussion will catch the attention of students and greatly stimulate students to take the initiative to explore and take the initiative to explore their interest. More opportunities for English communication will help students apply English tools to mechanics.

C. *The Revolution of Examination System*

The reform of the assessment system is a big challenge for the Engineering Mechanics course, since the course has book-closed examination for all years. And an important purpose of bilingual teaching is to cultivate students' language application ability. Therefore, according to the characteristics of Engineering Mechanics course of bilingual teaching, the idea of combining book-closed examination and book-open examination is put forward. The "Engineering Mechanics bilingual teaching questionnaire" reflects that some (25% or so) students hope that the combination of English and Chinese examinations, that is, in the form of Chinese questions, requiring students to answer English. The content of the closed book examines the basic theory and basic calculation methods of Engineering Mechanics course, and requires that the bilingual students are able to clearly express the contents of the words to be expressed and calculated in English. On the basis of the contents of the closed book examination, we increase the part of the actual engineering problems of oral discussion and students write articles about their own practical learning experience on the course. In this way, not only Engineering Mechanics theory and methods tested, but also the students self-taught original English textbooks ability is checked, it can help bilingual teachers understand the students' real requirements of the curriculum as well.

V. CONCLUSION

Bilingual teaching of Engineering Mechanics is a new attempt for agricultural colleges. After several years of teaching practice, we have accumulated some experience, but since bilingual teaching is an important way to cultivate excellent and internationally competitive talents, it is a great challenge and test no matter for students or teachers of their English level of the test and professional knowledge of the teaching and learning. The bilingual teaching model is only a start; we need constant efforts to keep exploring.

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