Practices and Experiences on the Curriculum Reform for English Teaching of Electric Machinery

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Abstract. The author, who is teaching electric machinery in a comprehensive university, carried out a curriculum reform in English teaching for electrical engineering major. In this article, the author shares the practices and experiences of the curriculum reform, providing the aim of the reform, the preparation of the English teaching, the important points in the course and the way to raise the academic presentation ability of the students. The author hopes that the curriculum reform can help the students to adapt themselves to the future research work more quickly and the practices and experiences of the reform can provide suggestions for the other researchers who are carrying out teaching reform in universities.

Introduction

With the development of China’s higher educations and scientific researches, the students who are going to be researchers need to be more international to catch up the research fronts and communicate with the foreign peers. Therefore, the English teaching in main courses in university becomes more and more important, especially in key universities where most students are going to do research related work in the future. In the autumn of 2001, the ministry of education started the “Bilingual Teaching Course Reform Plan” to raise the English ability of college students[1]. According to the definition in “Longman Dictionary[2]”, the “Bilingual Education” is defined as: the use of a second or foreign language in school for the teaching of content subjects. Therefore, the teaching in author’s class should be called “English education” more appropriately because the class is in total English to create a immersive learning atmosphere. Based on the condition of the department where the author worked in, a curriculum reform is carried out in the teaching of electric machinery, which is a main course in the department of electric engineering, to improve the academic English ability of the students for their future international communication. Because of the specificity of English teaching in professional courses, the preparation of the textbooks and the language skills training are important for the comprehension of the students[3]. The reform has been carried out for two years and received impressive achievements. The students show good comprehension in reading international literatures and adapt to the advanced research work more quickly. The practices and the experiences of the reform are presented here to give suggestions to the researchers who are engaged in curriculum reform in universities.

The Aim of the Curriculum Reform

The aim of the curriculum reform contains the following points: first, the traditional teaching method need to be changed in the teaching of electric machinery. The traditional teaching method in this course usually starts from deducting the electromagnetics principles, and then comes to the applications of the machines and transformers in industry applications. The deducting of formulas and principles is usually too complicated for students to understand, which is separated from the applications in the industry. The reform will be carried out in the teaching method to make the class more related to the applications and the course will emphasize more on the specific circuit model
rather than abstract deducting, helping the students to start from the easy one to the difficult one. Secondly, the reform aims at improving the students’ professional English ability, which is helpful for the reading and writing research papers. Thirdly, the reform aims at improving the presentation skill of the students. For a long time, the students in Chinese university, especially in key schools, are good at exam rather than presentation. But in scientific researches, the ability to present is very important, especially in international conference. A good presentation can let more peers to know the results of your work, which is as necessary as good result itself. Last but not least, the reform aims at cultivating the student’s self-learning ability. Because of the limited time in the class, the teaching contents in the electric machinery class are very basic and limited to the primary knowledge of this discipline. Therefore, the students need to learn more about the new applications and new devices in the future research work. In this sense, the self-learning ability is as important as the knowledge that the students learn in the class itself.

The Preparation of the Textbook

The preparation of the textbook is an important work before the author carried out the curriculum reform. The teaching methods in the electric machinery in Chinese universities are learned from the Soviet Union from the last century. The textbooks used in the traditional class are focused on the deducting of the principles of the electromagnetics. Based on the detailed and complexed theory deduction, the applications of the theory on the industry applications such as electrical machines and transformers are introduced. These textbooks follow the law that the teaching starts from the micro to the macro. The advantage of these methods is that the students can learn the basic principles as detailed as possible, which helps them to build a firm base on physics and mathematics. However, the students majored in engineering usually do not need to learn the electromagnetics so deeply. The applications of the electric machines and other devices and the characteristics of these devices are much more important for the students in their future research works, for the reason that most problems in engineering can be solved without these complicated deduction. And starting from the complexed deduction of the basic theory, the students are easily to be confused and do not understand the meanings why they should learn these principles, which usually discourages the students and makes them lose their enthusiasm.

The textbooks used in North America are arranged in a totally different way. These books start from the circuit model directly, which is much more specific and easy to understand. Then the explanations of the principles in these models are added in the following courses. The students can get a better understanding of the meanings of these principles and have a more systematic grasp of what they learned by starting from the easy one to the difficult one. After a carefully selection, the textbook from Massachusetts Institute of Technology, Fitzgerald & Kingsley’s Electric Machinery (Seventh Edition), is chosen for the English teaching of electric machinery course. This book inherits the advantages of the North American textbooks and emphasizes on the application in electric machines and transformers. More importantly, many MATLAB exercises are included in these textbooks, which are very helpful for the students because the aid of computer is indispensable in the modern scientific researches.

The Experiences in Teaching the English Electric Machinery

The reform has been carried out for two years and the author has accumulated much teaching experiences. The author proposes these experiences in the following part, hoping to give suggestions for the other researchers who are carrying out the similar reforms.

Firstly, the language problems should be avoided otherwise they may hinder students from understanding the core knowledge of the course. It is well known in the electrical engineering students that the electric machinery is one of the most difficult courses in this department. Even taught by Chinese, the students are usually confused about the difficult definitions and principles, not to mention English teaching class. The first and the most important thing in English teaching is that
teachers should try their best to overcome language problems. Therefore, the author used a specific period of time in every classes to summaries the professional vocabulary in this chapter, in case that the students cannot understand the course because of the unknown words. In addition, the understanding of the complicated principles and definitions is another problem for the students taught by English. The solution that the author proposed for this problem is repetition. The key knowledge points must be repeated in the course periodically in the whole semester. By repetition, the students can not only grasp the key definition of the principles, but also get a much better understanding on how to use English to explain complicated definitions, which is a key skill in academic English.

Secondly, many principles and definitions in electric machinery are very abstract and difficult to understand. For example, the magnetic field is invisible and counter-intuitive for the students who first learn this course. The complex distribution of the magnetic field in the electric machine is hard for the students to imagine in their mind. Therefore, it is an effective way to show these knowledge in a much more specific way. For example, the animations are used in the class to display how the magnetic field moves in the two-dimension space in the cross area of the machine. Besides, the components of the machine are brought to the class to show the students what a real machine is, which is impressive to the students and can strengthen their understanding of the knowledge they get in class. In addition, many experiments are designed to help the students use what they learned in the books to solve the real problems. By operating the real machines and transformers, the students get a deeper understanding of the principles they learned.

Thirdly, the routes in teaching the lessons should be clear. The electric machinery class is very complicated, which has many branches from the main knowledge tree. Many applications and specific use of the principles are proposed now and then when teaching the main content of the course. Therefore, it is very important to propose a clear frame of the knowledge in this course. The relations between the main knowledge and branches like other applications should be handled properly in case of making the students confused.

Lastly, the transition between every class is very helpful for the students to have a clear understanding of what they learned. It is a common problem that the students may get lost after a whole class of difficult deduction. Then it is the time that the teachers should reemphasize the meanings of this class and help the students be aware of the main knowledge frame all the time. At the beginning of every class, the teachers should give a brief but clear review of the last class and the main target in this class. And at the end of the class, the teachers should give a review of the main knowledge of this class and help the students to review after class and get prepared for the next lesson.

The Cultivation of the Presentation Ability of the Students

The cultivation of the presentation ability of the students is a main point of the curriculum reform. The students in Chinese universities are usually good at passing exams, rather than doing presentations in the public. But the presentation is important in communicating ideas in the international conferences in scientific researches. Unfortunately, the education for the skill of presentation is lacked in the university. Therefore, the presentation skill education is emphasized in the course. An presentation task is assigned to the students at the end of the course, aiming to train the oral expression ability, teamwork ability and self-learning ability of the students.

Firstly, the teamwork ability of the students is trained in the presentation. The students are divided into different groups of three to four persons. Each group can select a front topic in electric machinery, like new applications of machines, electrical cars and wind turbines. After investigations of several weeks, each group should present what they learned about this topic in the class. During this process, the teamwork ability of the students is trained. Because these topics are usually difficult for the students who just learn basic knowledge in the class. Only through good team cooperation and work assignment can they achieve better results. This ability is beneficial to the students because the research work is teamwork in modern scientific researches.
Secondly, the self-learning ability is trained in the presentation. The tasks are based on the basic knowledge in the class but contain many new knowledge points. These topics are usually state of the art, including the newest applications of the electric machinery. Therefore, the students should learn by themselves to prepare for the presentation, which contains searching and reading literatures, simulating on the computer and deducting principles by themselves. And in the presentation, all topics are presented in the class, which helps the students to enhance their vision and learn much about the front of the researches.

Thirdly, students have a deeper understanding of the process and the details of the academic report. A professional academic presentation contains many details for students to learn. The outline and the frame of the presentation should be clear to help the listener to keep up with the reporter. And the texts in the slides should be limited and the figures and the tables should be visualized, in case that the listeners are confused by too many texts. The page numbers should be marked for the convenience of the listeners to raise questions. These are all common problems that the students may have in the presentations and the training of the presentation skill can help them do better in the future academic reports.

Last but not least, the oral expression ability of the students is strengthened in the training. In the presentation session, every student is demanded to give a presentation alone for a period of time, which can strengthen their oral English ability and enhance their confidence in speaking in public. And by comparing the different presentations they listened, the students will have a better understanding how to give a report better. And at the end of each report, there will be a question and answer session, during which the students can ask questions to the speaker. Through question-and-answer, the ability of both sides to communicate academically in English has been trained.

Summary

The curriculum reform for English teaching in electric machinery in author’s university has improved the academic English skill of the students, which is beneficial for their future development in scientific researches. In addition, the teamwork ability, the self-learning ability and the presentation ability are also trained in the courses. The practices and experiences of this reform may give a suggestion for the researchers in the future curriculum reforms, especially for the key universities where a large number of the students will do scientific researches in the future.

References

