Instructional Design and Practice of Specialized English, an Application-oriented Graduate Course for Mechanical Engineering

Rong ZHANG¹,a, Jian-Jun WEI¹,b* and Hua GUO¹,c

¹School of Mechanical Engineering, Guangxi University of Science and Technology, 268 Donghuan Road, Liuzhou, Guangxi Province, China

a592443973@qq.com, bweijianjun629@163.com, c1043991733@qq.com

*Corresponding author

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Abstract. The features of Specialized English, a graduate course for mechanical engineering for applied universities, are analyzed; The goal, contents, and corresponding application-oriented instructional strategy of the course are designed and determined based on application investigation; Explorational instruction practice with multiple methods have been carried out.

Introduction

With the peaceful rise of China and the implementation of her one road one belt strategy, there is a great demand for engineering technical talents with international visions. These talents are normally educated and trained in master and doctoral programs. Graduates from post-graduate programs will usually be employed to do leading technical research and application works in relevant fields. Academic research needs cooperation, and international academic exchanges are very necessary for scholars. English for mechanical engineering is a specialized language platform for international academic exchanges in mechanical engineering field. The Specialized English, a graduate course for mechanical engineering, is very important for training students in post-graduate programs to gain those abilities.

Features of Specialized English for Mechanical Engineering

In our curriculum of graduate mechanical engineering program, 32 class-hours are arranged for Specialized English, 2 credit points will be granted to students who finish studying and past the evaluation. In light of the relative short time arrangement, instruction methods and training of learning ability should be emphasized in implementing Specialized English course, or as it is said, Teaching-a-Man-to-Fish should be considered as the main strategy.

Specialized English for mechanical engineering is different from public college English not only in the way to express professional concepts, theories and entities, but also in the goal and methods of learning. Vocabulary, sentence structures and styles in Specialized English for Mechanical Engineering bear the features of relevant mechanical expertise, and are influenced by practitioners in the field. Specialized English for mechanical engineering is also different from bilingual courses. A bilingual course is a course in which two languages are used in instruction and learning new knowledge, while Specialized English is a special language course in which specific subject matters are involved. In Specialized English, students are trained to use English as an international tool to understand and express theories, technologies and methods, and communicate with peers and counterparts in subject field.

According to application investigation, for a graduate student in mechanical engineering, the acquisition of subject matter knowledge is the tasks of other technical courses, involving machine principle, mechanical design, manufacturing technology, automation, etc., while how to express and communicate these knowledge precisely in English is the domain of Specialized English. The technical vocabulary in Specialized English is more exclusive due to the rigorousness of technologies.
concerned. The expression of principles and methods of relevant technologies is better to be precise, simple and clear, while public college English is more flexible in using vocabulary and wording.

Course Design and Practice of Specialized English for Graduate Mechanical Engineering

Goal of Specialized English for Graduate Mechanical Engineering

Based on the features of Specialized English for graduate mechanical engineering and results of English application investigation of our graduated students in their everyday technical works, the course goal of Specialized English is set as: after completion of the course study, students are required to: be familiar with the English vocabulary in mechanical engineering and master the general expression methods; to gain the ability of information searching, processing and reorganizing; to gain the abilities of fast reading and comprehension; to gain the skills of Chinese to English, English to Chinese translation; to train the ability of academic paper writing; and to train the ability of oral communication for future academic exchange and research cooperation.

Contents of Specialized English for Graduate Mechanical Engineering

The goal of Specialized English is for the students to gain English application ability in mechanical engineering by conducting listening, speaking, reading and writing trainings. Those technologies involved are only media and topics with which the instruction is organized. Due to the class-hour limitation, it is impossible to include all subject matters, therefore, only those commonly dealt with, relatively easier yet with some sort of novelty, are selected for use in instructions. Such as: introduction to conventional and modern manufacturing technology; application and development of computer and communication technology in manufacturing field; fundamental theories in manufacturing technology; computer-aided engineering; robotics and automation, etc.

Textbook Selection of Specialized English for Graduate Mechanical Engineering

English training rather than technical knowledge learning is the goal of Specialized English for graduate mechanical engineering, instruction is organized according to course strategy, textbooks are only reading materials for the students. A book, English for Mechanical Engineering, written by the authors of this paper, is used as main instruction reference book, while books and database in university library, materials from internet are all categorized as instructional resources.

Instructional Method and Practice of Specialized English for Graduate Mechanical Engineering

According to investigation, only 4.4% graduate students can keep in sound learning state in their studying, while 33% graduate students tend to have learning burnout phenomena, and 62.6% are in volatile interim state\[1\]. Effective instructional ways and methods are very important to guarantee the instruction outcomes.

Specialized English for graduate mechanical engineering bears the features of foreign language education, research achievements in foreign language teaching are helpful and should be applied. Foreign language teaching research is a multi-disciplinary mission, involving linguistics, pedagogy, psychology, sociology, computer aided instruction, etc. A lot of ways and methods have been established by different educationalists with different theories, such as Translation Method, Direct Method, Situational Teaching Approach, Communicative Approach, Task-based Approach, etc. According to different teaching activities, some of them can be applied solely, or in combination, in implementation of Specialized English to obtain satisfactory effects. For example, Translation Method can be chosen in teaching mechanical vocabulary. The meaning of terminologies in mechanical engineering can be explained precisely with Chinese language, misunderstandings can be avoided. A terminology is relatively fixed with specific connotation, for example, ductility and malleability are two words to describe the properties of material extensibility when a tensile and a compressive force are applied respectively. In Chinese language extensibility is no longer subdivided, so connotation and application should be explained precisely with native language in
order for the students to fully understand the meanings and subtle differences between these two words.

The combination of Direct Method and Communicative Approach is often used in training oral expression ability. The basic principle of Direct Method is the so called children-learn-language-theory, or using foreign language to learn foreign language. Communicative Approach regards language as communication tool, the trainings of trans-cultural communication ability, social language ability, discourse competence, and the ability of adaptability to change are emphasized. Information gaps can be set among communication participants when simulating communication scenarios and designing instructional activities. The closer to reality the communication activity is arranged, the better learning outcomes can be obtained.

A typical communication activity is designed with the topics in computer aided engineering, involving technical knowledge of design for manufacture and assembly, green design, etc. The class is divided into several group, each group is assigned to search, select and reorganize information about a design theory collectively, and prepare a PPT file for presentation in the class. In the process of a presentation, students from other group can ask questions, discuss, even debate with the presenter. The teacher serves as activity organizer and gives comment and grade for each presentation. The students are effectively motivated to play their roles in the activities, only English is used in the whole process, technological matters are directly connected to English without Chinese relay.

Education technology is helpful for instruction. According to behaviorism, connection will be established between the learner’s sensational experience and nervous impulse with conditioning of repeatedly external stimuli[2]. Situational instruction videos, animations are introduced in Specialized English to enhance teaching and learning efficiencies. For example, manufacturing a turbine blade with a five axes machining center was filmed as a video clip, which is very helpful in instruction concerning numerical control technology.

English language is a tool, the ultimate goal of language learning is to use this language. For graduate students, the basic language skills have been established after completion of public college English, application should be emphasized in Specialized English, or learning by using, by doing things. Instruction activities are designed according to concrete goals in teaching processes, students are motivated to accomplish those instruction missions. By doing so, their cognitive strategies are developed, together with training of team-work spirits, willingness of participation and language abilities. And ultimately, the course goal of communication with English is fulfilled[3]. Application is a direct experience in the Tower of Dell's Experiences, knowledge and skill can be obtained more easily through direct experiences[4]. In practices of Specialized English for graduate mechanical engineering are often implemented with tasks for the students to use English. For example, tasks to write an academic paper, to search and process information, to introduce a product or a technology, etc. are assigned to students, their abilities are enhanced gradually and unwittingly in the processes of accomplishing these tasks.

Summary

The ability to conduct trans-border, trans-culture academic exchange is not only the necessary quality for a senior subject matter expert, but also a requirement for practitioners doing frontier research works in the field. The course of Specialized English for graduate mechanical engineering is an important means to train this quality. Although Specialized English learning is a long accumulating process, an application-oriented course strategy and implementation plan, with features of learning by doing and learning for doing, are proved to be efficient for training within a limited time interval.

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References


