

# IMPLEMENTATION CDIO CONCEPT IN BILINGUAL TEACHING IN NON-ENGLISH-SPEAKING COUNTRY: A COURSE STUDYING IN DIGITAL IMAGE PROCESSING

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## ABSTRACT

Bilingual teaching is one of the most significant teaching modalities in non-English-speaking country, and becomes a routine engineering education method in China. Different from the traditional teaching method using native language (Such as Chinese), bilingual engineering teaching typically includes scientific English teaching as an important complement for teaching of professional knowledge. However, engineering teacher's lacking of teaching skill and experience in language teaching will probably make negative impact to bilingual engineering teaching. Moreover, the nonproficiency using of English from both teacher and student may become a barrier in class, which makes such course tend to a one way task.

This course based study examines how the reconstructed curriculum using CDIO concept can improve the teaching effect in both professional knowledge and scientific English knowledge, as well as other studying activities in the course.

The data were collected from an undergraduate Digital Image Processing course at Chengdu University of Information Technology, China. Two groups of students from 3<sup>rd</sup> year undergraduate students are compared. One group was taught in the traditional bilingual method which teaches professional course and scientific English course separately, the other one studied using reconstructed CDIO curriculum which integrates both professional knowledge and scientific English in a single course. Academic scores for both professional knowledge and scientific English knowledge were test as the quantitative evaluation, and subject survey of students to evaluate the teaching effects was also taken as well.

The research showed a significant improving in study confidence and interests of students in professional knowledge as well as scientific English according to the subjective survey. Besides that, the academic scores of the professional knowledge are similar for both teaching method (an average point of 48.15 in a total 70 points of the traditional method compared with an average point of 47.93 using the reconstructed CDIO bilingual teaching). However, the academic scores of the scientific English in the new way achieved significant improvement for the average point of 21.78 in a total 30 points compared to the students in the old method only got 17.47 averagely.

The study suggests that using CDIO concept in curriculum design for bilingual Engineering teaching can significantly improve the study confidence and activate studying tendency of students. Meanwhile, the studying result of the professional English can also be enhanced through the CDIO framework together with a stable teaching effect in the professional knowledge.

**KEYWORDS** – CDIO, Bilingual teaching, Digital Image Processing

## INTRODUCTION

Bilingual teaching is one of the most significant teaching modalities in non-English-speaking country, and becomes a routine engineering education method in China. As it be pointed out by the 'National mid and long term develop and reform plan of China', more than 10% courses in high education will be implemented bilingually and most of them are engineering courses [1].

However, bilingual engineering education mainly has two drawbacks [2]. The first one is that bilingual engineering course requires additional professional English training which is hard to achieve. The second one is nonproficiency using of English from both teacher and student will hinder the teaching procedure especially in theoretical knowledge.

This paper compared two groups of students in digital image processing course using the traditional teaching method and reconstructed curriculum according to CDIO concept. The paper are constructed as follow: first, we introduce the reconstructed CDIO curriculum, second, the comparison method is described; followed by result of comparison; the conclusion is in the final part of the paper.

## **RECONSTRUCTED CDIO CURRICULUM IN BILINGUAL ENGINEERING EDUCATION**

The traditional bilingual engineering education implemented in CUIT is composed of two independent courses: scientific English course and professional course [3]. The scientific English course is taught in the third year undergraduate students who have finished two years English courses. This course will be taught for 32 lessons and each lesson for 45 minutes. The main teaching points are grammar of scientific English, scientific English reading and scientific English writing. Materials of scientific English reading include most of the engineering aspects, such as electronic engineering, computer science, mechanical engineering and so on. All the lessons are implemented in lecture and no experiment lesson. In a word, the traditional scientific English course is more like an English course, although is taught by professional teachers. On the other hand, the professional courses taught bilingually are different via the majors. For instance, students major in electronic engineering will have digital image processing as a bilingual professional course and students major in communication engineering will be taught communication theory bilingually. Every course has theory lecture first, and then practice in experiment. The text book is English version (Rafael Gonzales and Richard Woods, Digital Image Processing, Prentice Hall).

The reconstructed Digital Image Processing (DIP) course using CDIO concept integrates scientific English and professional course into a single course [4,5]. Dislike scientific English course teaching a wide range of professional vocabulary, the reconstructed curriculum distributes this vocabulary to individual professional courses. This change reduces the work of remembering but emphasizes the application which is much more useful for students. Besides this, the teaching modality for professional course is also modified using the CDIO concept. Compared with the traditional 'theory lecture and practice (or experiment)' method, the new curriculum divides DIP course into six parts: image enhancement, image restoration, image compression, image segmentation, morphological processing and color image processing. For each part, the theoretical teaching and exercise are integrated to a practical project. The designation of whole project are mainly taught in English, the detailed implementations using various theory are taught in both Chinese and English for better understanding, and students are grouped to design and implement this project.

For each individual project, all the knowledge points are divided into four different training levels according to CDIO concept: basic theory, individual application, communication and team working, design and implementation. Each level has its own requirement for both teaching and studying. The up mentioned six projects for DIP have similar framework: starting from analysis and discuss the designation of the project, theoretical teaching about the individual module of the project, application of these theory and the implementation of the whole subject. Each part of study is examined in groups for their implemented project and the final score of this course are accounted for both the score of these projects and the final examination (each for 50%).

## METHOD

For analysis the effectiveness of bilingual teaching using the reconstructed curriculum, two groups of students are chosen for comparison. Two groups are the third year undergraduate students in Chengdu University of Information Technology, one of them entrance university earlier than the other group in 2007 and taught in the traditional teaching method. The group taught using reconstructed curriculum entranced university in 2008 and both groups are major in electronic engineering. The number of students for each group is 95 (32 female) in traditional group and 76 (26 female) in reconstructed group. The text book using for the bilingual digital image processing course is the same for two groups and the name is Digital Image Processing (English version, Rafael Gonzales and Richard Woods, Digital Image Processing, Prentice Hall).

The academic score used for comparison are the final examination of DIP. This final examination composed of 70% test for professional knowledge and 30% test for professional English and all the tests are English. Besides this, a subject survey of students to evaluate the teaching effects was also taken as well; the detailed information about survey is in appendix.

## RESULT

The points of the average score of professional knowledge in final examination for both groups are demonstrated in Figure1. It can be seen that the points of professional knowledge do not show dramatic discrepancy between the two groups. The average point of the traditional group is 48.15 compared with 47.93 of the reconstructed group. In each group, female students got higher scores compared with males, however, students will same gender got similar score between groups.

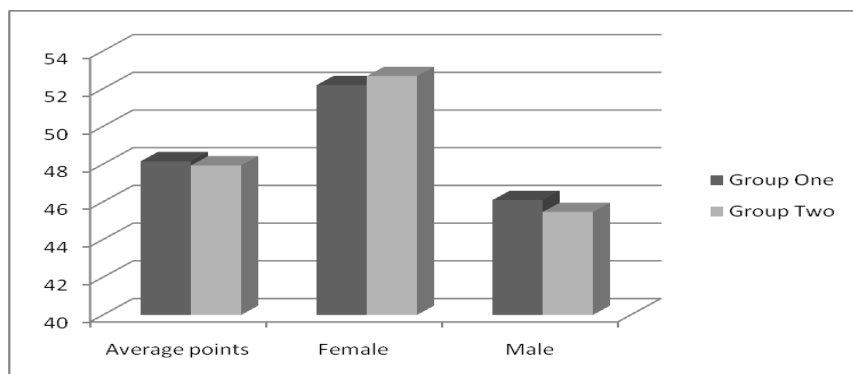


Figure 1. Average score of the professional knowledge. Group one (first row) is the traditional group and group two (second row) is the reconstructed group.

The average score of professional English in final examination is in Fig. 2. It is demonstrated that the group using reconstructed curriculum got significant improvement in their professional English study. They got an average score of 21.78 which is around 20% higher than 17.47 which is achieved by students using the traditional method.

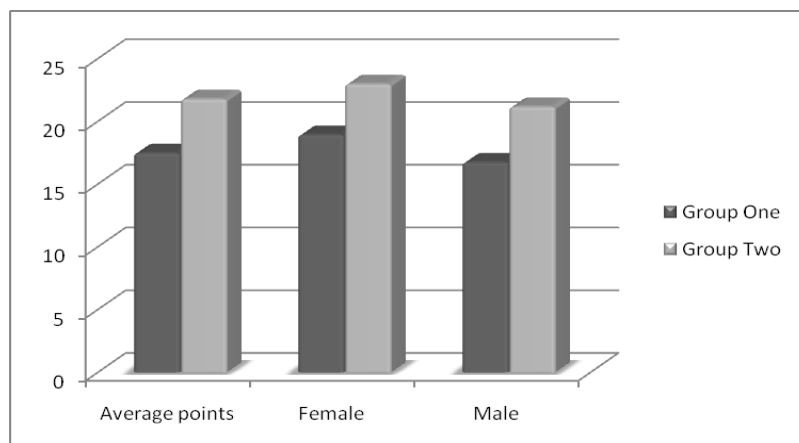


Figure 2. Average score of the professional English. Group one (First row) is the traditional group and group two (Second row) is the reconstructed group.

Fig. 3 is the result of subject survey of students about their attitude of reconstructed curriculum. The survey shows that the reconstructed curriculum demonstrates a dominant supports from students, especially in enhancing teamwork ability which was supported by all students. Besides, the reconstructed curriculum achieved significant improving of the professional English training which is also supported dominantly by students as in Fig. 3.

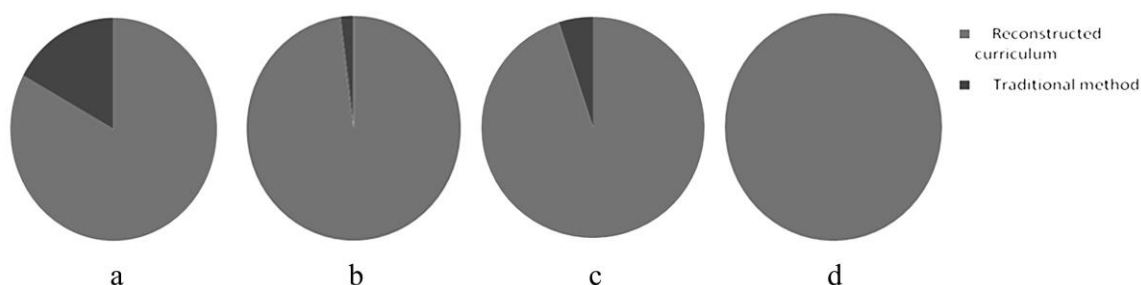


Figure3. Result of subject survey. a, usefulness for professional knowledge study; b, usefulness for professional English study; c, study interesting; d, enhancement of practical ability and team working.

## CONCLUSION AND DISCUSSION

Bilingual education becomes a routine teaching modality in most of the universities in China. In theory, the bilingual education course should mainly concern with the teaching of professional knowledge. However, due to the different English level of student, traditional curriculum has to add professional English course parallel or prior to the professional courses. This arrangement has a dramatic drawback that most professional English studied by students can not be used in professional knowledge study and will be forget easily. Meanwhile, vocabulary in specific professional course can not be included totally in professional English course, which means that bilingual engineering course must has additional professional English teaching.

In this paper, we analysis two groups of students in Digital Image Processing course using different teaching methods. One group taught using traditional teaching method which divided DIP into separate parts: professional English and professional knowledge course. Other group use CDIO concept reconstructed the curriculum which integrates the two course together and also modified the teaching framework. These two groups were compared

quantitatively and qualitatively using academic scores of final examination and subject survey. The result demonstrates that the new teaching method can significantly improve the score of professional English and enhance the interests of study together with the stable teaching effect in the professional knowledge.

## **APPENDIX**

### **Student Course Evaluation Questionnaire**

(To be filled by each student at the time of course completion)

Department: \_\_\_\_\_ course: \_\_\_\_\_

Year of study: \_\_\_\_\_ semester: \_\_\_\_\_

Please give us your views so that Course quality can be improved. You are encouraged to be frank and constructive in your comments.

1. Which one do you think is more useful for professional knowledge study?
  - a. Reconstructed curriculum
  - b. Traditional method
2. Which one do you think is more useful for professional English study?
  - c. Reconstructed curriculum
  - d. Traditional method
3. Is there big difference between reconstructed curriculum and traditional method?
  - a. Yes
  - b. No
  - c. I don't know
4. Which one do you think is more interesting?
  - a. Reconstructed curriculum
  - b. Traditional method
5. Which one will enhance you good ability of practicing and team working?
  - a. Reconstructed curriculum
  - b. Traditional method

**THNAK YOU**

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