REDESIGN OF A FRESHMAN ENGLISH COURSE FOR COMMUNICATIONS ENGINEERING FRESHMEN

Huey-Nah Cindy Chou, Ben-Ray Jai, Wei Wang

Feng Chia University, Taiwan

ABSTRACT

This paper reports results of the Freshman English course redesign for Department of Communications Engineering (DCE), Feng Chia University. Skills of teamwork, active learning, creative thinking, critical thinking, and communication in English as a foreign language were particularly emphasized in the redesign endeavour. In recent years, DCE has incorporated CDIO in its curriculum renovation by launching freshman projects, deep-bowl and capstone courses to continuously advance the quality of engineering education. Positive results of DCE's curriculum reform in developing students' disciplinary knowledge and competences are evident. Nevertheless, DCE still considered room for improvement, especially in students' personal and interpersonal skills. Therefore, in 2017, DCE started seeking cross-disciplinary collaboration with Foreign Language Center with keen determination to enhance, from the onset of college education, Freshman students' personal and interpersonal skills. With such an unprecedented collaboration, an integrated Freshman English program (DCEFE) was launched in Fall 2018 with distinctive features of learning English through active learning in the communication engineering context. Implementation and results of students' perceptions of the intended learning outcomes are presented for future applications of CDIO syllabus.

KEYWORDS

active learning, personal and interpersonal skills, Standards 2, 7, 8

INTRODUCTION

As the only CDIO initiative member in Taiwan, Feng Chia University (FCU) has been actively implementing CDIO at the university level by integrating the CDIO syllabus into the departmental curriculum design of all academic disciplines (Jai, Chou, & Chen, 2016; Lee, Jai, & Lee, 2019). This report focuses on why, how, and how effective from student perspectives the Freshman English course for Communications Engineering students was redesigned. The primary aim of the course redesign was to develop students' personal and interpersonal skills as delineated in the CDIO approach. By redesigning class activities based on the CDIO syllabus and Stanford University's design thinking methods (Kelley & Kelley, 2014), it was anticipated that engineering students' active learning, creative thinking, critical thinking, communication in English as a foreign language, and teamwork skills will be enhanced to reach expectations of their future employers.

In recent years, Department of Communications Engineering (DCE), an IEET (The Institute of Engineering Education Taiwan) accredited department, has further incorporated CDIO in its curriculum renovation by launching freshman projects, deep-bowl and capstone courses to continuously advance its engineering education to meet the trends and needs of global industries. Positive results of DCE's reform in developing students' disciplinary knowledge and competences are evident. Nevertheless, DCE still considered room for improvements in personal and interpersonal skills to gain a more in-depth implementation of the CDIO syllabus.

Therefore, in 2017, DCE started seeking cross-disciplinary collaboration with Foreign Language Center with a keen determination to enhance integrated and active learning of freshmen. The redesign effort of the Freshman English course for the Department of Communications Engineer (DCEFE) was based on the CDIO Standards 7 and 8 (Crawley, Malmqvist, Ostlund, & Brodeur, 2014), integrated learning experiences and active learning, respectively. Rooted in the standards, the DCEFE redesign was set to achieve simultaneous development of disciplinary knowledge and professional skills, i.e., personal and interpersonal skills. Individual student's engagement, creative thinking and critical thinking skills are keen to personal development. In particular, the DCEFE course were to meet the CDIO syllabus items 2.4: attitudes, thought and learning, 3.1: teamwork, 3.2 communication, and 3.3. communication in foreign languages. Teamwork and communication skills, especially communication in English as a foreign language, are keen to the enhancement of effective interpersonal development. Moreover, about Standard 8, active learning, the course featured learning activities which foster student engagement and interaction. With such an unprecedented collaboration at Feng Chia University, DCE was able to infuse into its mindset of engineering pedagogy with language teaching activities inducing to student engagement, interaction, and communication.

THE DCEFE COURSE DESIGN

The existing university-wide Freshman English course of Feng Chia University follows a unified syllabus which aims to strengthen students' reading and communication skills. Its class activities are primarily based on conventional English teaching methods such as Grammar Translation and Communicative Language Teaching, which feature predominantly lectures and exercises for preparing for exams. Paper-and-pencil midterm and final exams for summative assessment weigh 40% of the semester grade.

To turn learning from passive to active, from surface to deep, and from summative to formative, it is necessary to redesign the existing university-wide Freshman English course to better fit the needs of engineering students. Thus, a major purpose of the DCEFE course design was to infuse the CDIO approach, active learning, and design thinking (Kelley & Kelley, 2014) methods into the class activities to engage students directly in thinking, teamwork, and communication. In light of the aforementioned teaching and learning approach and methods, the DCEFE employed collaborative project-, problem-, and task-based activities in the communications engineering context, which are aligned with intended outcomes and assessment. Examples of active learning activities including World Café, Gallery Walk, mind mapping, posters, elevator pitch speeches, and other student-centred activities are shown in Table 1 and Figure 1.

Table 1. Sample Topics of the DCEFE Learning Activities

Topic	Group Task	Intended Outcome	Relates to CDIO Syllabus
Driverless Cars	Help wanted! Please use words, sketches and illustrates to help me understand better what they are and how they function on driverless cars. • Lidar • Bumper mounted radar • Ultrasonic sensors	Explain the technical terms orally and graphically	2.4.3 creative thinking 3.2.5 Graphical communication, 3.2.6 Oral presentation, 3.3.1 English
Battling Smartphone Zombies	What do you think? 1. Why do people engage in unsafe smartphones use while walking in public? 2. How to prevent pedestrian injuries and fatalities from happening?	Report your responses both in drawing and in writing	
Internet of Things	Gallery Walk 1. Kevin Ashton and the groundwork 2. Solved obstacles 3. What is IoT and what can IoT do? 4. Connecting industrial equipment 5. Sharing communication 6. IoT vs. traditional computing	Your group is the teacher who should instruct the assigned paragraph to other groups. Illustrate your understanding in multiple modes of communication.	2.4.4 critical thinking 3.2.5 Graphical communication 3.2.6 Oral presentation and Interpersonal communication 3.3.1 English
The future of communication	World Cafe Everyone should attend all five tables and contribute your thoughts and ideas on the table theme.	Present your thoughts and ideas clearly to the table master. An accepted idea is the one which is creative, innovative, and convincing.	2.4.3 creative thinking 3.2.5 Graphical communication 3.2.6 Oral presentation & interpersonal communication 3.3.1 English

Figure 1. Active learning activities in the DCEFE class

METHOD

Participants

Two classes of DCEFE with a total of 56 students were surveyed in the final week of the Fall semester, 2019. There were 11 females and 45 males. 53.6% of them started learning English as a foreign language at kindergarten, 26.8% at Grades 1 to 2, 12.5% at Grades 3-5, only 7.1% at a later time. 57.1% of the students believed that they can cope with daily communication functions in English. Moreover, concerning learning preferences, 50% of the students considered lecturing as their preferred learning approach.

Measure and Procedure

To gain an in-depth understanding of student perspectives on the course design of DCEFE, a survey instrument was developed by the authors with a primary aim to measure students' perceptions of intended outcomes of personal and interpersonal skills development. It is a Likert scale instrument with response options between 1 to 5 with 1 being strongly disagree, 2 disagree, 3 neutral, 4 agree, and 5 strongly agree. As for data analysis, a description design was used to examine student' perceptions of the impacts of a resigned Freshman English course for communications engineering students on the personal and interpersonal skills of the CDIO syllabus, with special emphases on 2.4.3 Creative Thinking, 2.4.4 Critical Thinking, 3.1 Teamwork, 3.2 Communication, and 3.3 Communications in Foreign Languages.

RESULTS AND DISCUSSION

Two classes of DCEFE students with a total number of 56 participated in the survey in the final week of the Fall semester, 2019. As aforementioned, the course redesign effort was to integrate the CDIO syllabus in a freshman English course with special focuses on the

development of personal and interpersonal skills. In addition to the descriptive statistics for students' perceptions of personal and interpersonal skills, perceptions of the overall development resulted from the integrated and active learning experiences by participating in class activities is also reported. Means, standard deviations, and frequencies and percentages of affirmative responses (i.e., strongly agree and agree) are reported in the tables below.

Development of Personal Skills

Four aspects of personal skills development were examined: initiating thoughts and ideas, engagement in class activities, increased creative thinking, and increased critical thinking (Table 2). As found in this study, the students positively responded that the redesigned DCEFE course provided more opportunities for them to initiate individual thoughts and ideas. They also expressed that by engaging more actively in learning tasks, it helped increase their creative and critical thinking skills. Moreover, it is worth noting here that relatively fewer students (n = 38, 67.9%) agreed that their critical thinking skills had been enhanced in the class. Such a result might have been caused by two reasons. First, being exposed to learning English through the grammar translation method for purposes of memorization and passing exams, students tend to be used to passive and surface learning from lectures. As a result, they were more hesitant when being asked to pose personal points of view in class. Second, it takes time to change students' learning habit from passively receiving knowledge to actively expressing personal views. Such a radical change of learning habits could cause uneasy and intimidating feelings on the freshman students, especially in adapting to a new learning context of the university. As also suggested by Crawley, et al, (2014), students' resistance to change to the way they are accustomed to teaching and learning is a challenge in implementing active learning.

Table 2. Perceptions of Personal Skills Enhancement (*N* = 56)

Item	Mean	SD	Freq.	%
Initiating thoughts and ideas	4.12	.79	44	78.6
Active engagement	4.13	.74	44	78.6
More creative thinking	4.21	.68	48	85.7
More critical thinking	3.91	.79	38	67.9

Note. Frequencies and percentages are of affirmative responses: strongly agree and agree.

Development of Interpersonal Skills

Regarding teamwork of interpersonal skills, it can be seen that the students had noticed their progress in collaborative learning, brainstorming with peers, asking for help, working with others for clarification of instructor's questions, solving problems collaboratively, and actively helping others (Table 3). Being used to passive learning for memorization and passing exams, it can be easily assumed that the communications engineering freshmen had preferred working and solving problems individually. In general, they would rather resolve learning difficulties by "studying harder" then by consulting with others. After experiencing active learning in the DCEFE course, the students effectively deepened their teamwork and collaboration competencies.

In terms of the development of communication skills, the students saw their improvement in expressing personal ideas more often in class and in the ability to present ideas in multiple modes of graphic, oral, sketching, and written communication. As aforementioned, face-to-

face communication is not easy for students who are accustomed to traditional ways of teaching and learning. Undoubtedly, it would require a giant leap for the students to step out from their "comfort zone" and step in a communicative and interactive learning environment. Although adapting to active learning can be challenging to students, it can be confirmed here that it works to change students' learning habits and, at the same time, to improve their communication skills.

Table 3. Perception of Interpersonal Skills Enhancement (*N* = 56)

Item	Mean	SD	Freq.	%
Teamwork				
More collaborative learning	4.39	.62	52	92.9
Would brainstorm with peers to complete tasks	4.23	.66	51	91.1
More problem solving opportunities for group problems	4.16	.76	49	87.5
More collaboration for clarifying questions	4.25	.64	50	89.3
Would help solve peers' problems	4.16	.56	48	85.7
Would ask for help from peers	4.25	.67	51	91.1
Communication				
Would express ideas more often	4.25	.64	50	89.3
Would express ideas in multiple modes	4.23	.76	50	89.3

Note. Frequencies and percentages are of affirmative responses: strongly agree and agree.

Overall Development of Professional Skills

The DCEFE course aimed to infuse the CDIO approach and integrate the CDIO syllabus items of 2.4: attitudes, thought and learning, 3.1: teamwork, 3.2 communication, and 3.3. communication in foreign languages to enhance students' personal and interpersonal skills. It is thus crucial to examine whether the redesign effort effectively achieved the intended goal. Undoubtedly, students' perspectives play an indispensable source of feedback in the redesign and implementation process. The students' feedback, as shown in Table 4, indicated that they reacted positively to the key aspects of professional skills development, which helps validate that the course redesign by integrating the CDIO syllabus is in the right direction. Also, it is worth noting that not only that the students found their teamwork skills were improved, they would also continue to apply the skills developed from DCEFE to other classes. Likewise, class engagement and active thinking were also responded positively by the students and will impact other areas of disciplinary and professional development. Most importantly, motivation for learning (*M* = 4.32) resulted from the active learning was also highly rated. Such a result strongly validates the effectiveness of CDIO standard 8, active learning and is aligned with Crawley, et al. (2014):

"CDIO programs integrate the learning of professional engineering skills with disciplinary knowledge through active and experiential learning methods. Through the implementation of the CDIO approach to learning, engineering programs become more attractive to students. Students find meaning, motivation, ad personal development in learning experiences that result in conceptual understanding, in developing engineering skills and attributes, in working with real problems in context, in aligning education with professional practice, and in a purposeful approach to engineering in society." (p. 146)

Table 4. Perceptions of Overall Development of Professional skills (*N* = 56)

Item	Mean	SD	Freq.	%
Higher motivation for learning	4.32	.69	49	87.5
Higher comprehension of content	4.29	.62	51	91.1
Change of habitual learning styles	4.27	.82	48	85.7
Using more creativity in completing group work	4.29	.76	51	91.1
Would apply cultivated engaging attitudes to other classes	4.21	.80	48	85.7
Would apply cultivated teamwork skills to other classes	4.34	.77	48	85.7
Would apply cultivated active thinking skills to other classes	4.13	.76	45	80.3

Note. Frequencies and percentages are of affirmative responses: strongly agree and agree.

CONCLUSION

This study aims to understand from student perspectives results of a redesigned Freshman English course, DCEFE, for communications engineering freshmen. Rooted in the CDIO approach, an important purpose of the redesign was to provide English language training in the engineering context through integrated learning and active learning methods. That is, students were required to apply disciplinary knowledge in communicating technical ideas and in English as a foreign language. In partaking in problem- and task-based learning activities, the students described, argued, reasoned, and planed with their team partners to complete group projects. It showed that through active learning, the students were effectively enhancing their motivation, personality, and interpersonal skills in addition to reinforcing disciplinary knowledge. Such positive results are aligned with previous studies (Edstrom, Tornevik, Engstrom, & Wiklund, 2003) that students are more likely to achieve intended outcomes and more satisfied with the learning outcomes when they are engaged in integrated and active learning. Such results further help validate the appropriateness and necessity of implementing the CDIO approach in training engineering students' communication in English, along with other intended development of teamwork, creative and critical thinking skills.

In conclusion, in contrast to traditional approaches to English language training and engineering education which are mostly rooted in teacher-centeredness and knowledge-based instruction, active learning works to enhance personal and interpersonal skills, and motivation as well. Motivation is relatively low when students do not know the reasons why they should engage in learning. On the other hand, when students perceive clear intended outcomes relevant to the real world and when they find meaning and personal development, they start to appreciate the relevance and worth of learning. And when students start to appreciate the relevance and worth of learning, they will discover their potentials in accomplishing any challenges that will lead to a successful future as engineers.

REFERENCES

Crawley, E., Malmqvist, J., Ostlund, S., & Brodeur, D. (2014). *Rethinking engineering education: The CDIO approach* (2nd ed.). Switzerland: Springer.

Edstrom, K., Tornevik, J., Engstrom, M., & Wiklund, A. (2003). Student involvement in principled change: Understanding the student experience. *Proceedings of the 11th International Symposium Improving Student Learning, OCSLD*, Oxford, England.

Jai, B.R., Chou, C., & Chen, S.H. (2016). *Creative thinking and practices*. Taichung, TW: Center for General Education of Feng Chia University.

Kelley, T., & Kelley, D. (2014). *Creative confidence: Unleashing the creative potential within us all.* London: William Collins.

Lee, B.J., Jai, B.R., & Lee, Y.C. (2019). *The integration and implementation of CDIO educational framework*. Taichung, TW: Center for General Education of Feng Chia University.

BIOGRAPHICAL INFORMATION

Huey-nah Cindy Chou is a Professor of Center for General Education at Feng Chia University. Her expertise covers second language acquisition, language assessment, and language teaching methodology. She is currently Director of Foreign Language Center and Director of Pre-major Program for International Freshman Students.

Ben-Ray Jai is a Professor of the Department of Cooperative Economics and Social Entrepreneurship at Feng Chia University. His expertise includes sociology theory, social enterprise, financial sociology, and cultural anthropology. He is currently Director of Center for General Education, Dean of Humanities and Social Sciences, Dean of School, and Chair of Department of Chinese Literature.

Wei Wang is a Professor of the Department of Economics at Feng Chia University. Her expertise covers Microeconomics and Mathematics for Economics. She is currently Dean of Office of Academic Affairs.

Corresponding Author

Huey-nah Cindy Chou, Professor
Center for General Education
Feng Chia University
Taichung, Taiwan
+886-4-2451-7250 ext. 5870
hnchou@fcu.edu.tw