An English Course Development Specialized for Engineering Students at Hanyang University

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Abstract

In line with the Korean government's efforts to bring up "brains" of the 21st century in Korea, the Center for Innovation in Engineering Education of Hanyang University has developed an English course specialized for engineering students. The course aims to educate the students to develop the competencies that are required in their future studies and career: professional knowledge, interpersonal and communicative competences. The underlying educational principle of the course is that language acquisition occurs while the learners use the target language for authentic purposes. Based on this principle, the class is designed in such a way that the students are constantly engaged in problem solving tasks. Throughout the course, the students are encouraged to explore various engineering topics, to conduct systematic problem analyses, and to collaborate for creative problem solutions. The course requires the students to make three oral presentations and write three essays in English on engineering related topics. Having got into the third year of the program in spring 2009, the students evaluate the program as very rewarding in that the course well prepares them for the workplace as well as graduate school.

I. Introduction

In the ever-more industrialized and globalized world of the 21st century, there have been growing demands for the engineers who have not only the professional knowledge but also the global leadership. In order to foster such engineers in Korea, the academia of engineering launched its attempt to develop a more systematic education program for engineering students. In 1999, the Accreditation Board for Engineering Education of Korea (ABEEK), an independent nongovernmental organization, was founded.

ABEEK set its mission as implementing innovating engineering education and accordingly established the accreditation criteria, which aim to enhance the quality of the engineering education programs as well as the engineering students' professional competences. Among the seven accreditation criteria ABEEK created, criterion 3 specifically illustrates the required competences that the engineering students should develop (ABEEK, http://www.abeek.or.kr). They are:

  a. An ability to apply the knowledge of mathematics, science, and engineering science
  b. An ability to design and conduct experiments, as well as to analyze and interpret data
  c. An ability to design a system, component, or process to meet desired needs
  d. An ability to function in multi-disciplinary teams
  e. An ability to identify, formulate, and solve engineering problems
  f. An understanding of professional and ethical responsibilities
  g. An ability to communicate effectively
  h. A broad education which is necessary to understand the impact of engineering solutions in a global and societal context
  i. Recognition of the needs, and an ability to engage in life-long learning
  j. Knowledge of contemporary issues in the society, economy, environment, and law.
  k. An ability to understand other cultures and engage in international collaboration
  l. An ability to use up-to-date techniques, skills, and modern engineering tools required of engineering profes-

sionals

Out of these twelve requirements, more than half of the competences refer to the necessity for the world knowledge, communication and collaboration skills in the global community. That is, the engineering students should be prepared to work professionally and collaboratively in the global society. This called for the development of a convergent education program across the fields of mathematics, science, and engineering science as well as Korean language and English language education.

In response to the societal needs for the qualified global engineers, the Center for Innovation in Engineering Education (CIEE) of Hanyang University organized an educational development committee and developed specialized courses. In this paper, the writer will introduce the development of an English program specialized for the engineering students at Hanyang University along with its curriculum and outcomes.

II. Course Development

1. Course Objectives

The English course for the engineering students at Hanyang University focuses on the development of the oral and written communication skills, which are required in the globalized world community. The CIEE of Hanyang University established a five-year project to develop a series of courses that would train the students as qualified for ABEEK certification. A course named Hanyang Test of Presentation Skills (H-TOPS) was initiated to educate the global communication skill, which is one of the required qualifications from ABEEK. The H-TOPS course development committee was composed of the faculty from the engineering, English language and literature, and English education departments. The course development evolved from the following objectives:

a. Understanding of the engineer's role in the 21st century: engineers play a critical role in this world of advanced technology. Engineers contribute to make people's lives more comfortable and convenient. They can also either prevent or cause major incidents depending on whether they apply their expert knowledge with integrity or not. Students develop an understanding of the engineer's significant role through extensive reading on a wide range of engineering topics, and establish a role model.

b. Critical thinking and creative problem solving: engineers must critically analyze the problems that exist in the market and draw creative solutions to them. Students develop critical thinking and creative problem solving skills by reading and conducting case studies on the real life issues.

c. Collaborative working: in the globalized world community, engineers work in a multi-cultural environment meaning that they work with the people from different backgrounds such as prior academic knowledge, work experiences, genders and ethnic cultures. Students understand the cultural diversity and develop effective communication and negotiation skills through extensive reading and face-to-face topic discussions.

In order to achieve the course objectives mentioned above, the H-TOPS committee specified the competences required for the certification.

a. Research skills: ability to conduct comprehensive research in order to elicit the required expert knowledge in their fields.

b. Oral presentation skills: ability to convey their professional knowledge clearly and efficiently to the people outside their fields so that they could market their intellectual asset as economically valued asset.

c. Academic writing skills: ability to write creative ideas in the engineering field and publish without copyright infringement on the global standard.

    d. Collaboration skills: ability to work collaboratively by developing multi-cultural understanding, communication and negotiation skills.

The committee also paid attention to the significant role of the assessment in the English as a foreign language (EFL) learning environment. That is, since most EFL students do not need to use English for authentic needs in their everyday lives, students learn English only to pass the tests, to earn credits and/or to get jobs after graduation. For this reason, the course assessment greatly influences how the students engage themselves in their learning. With this in mind, the H-TOPS development committee strived to develop an ideal testing tool as the ultimate goal of the course, which is also indispensible in a certification program.

2. Development Stages

The course was planned to develop through three stages under five-year project starting from 2007 as an elective and as a mandatory course by the end of the project in 2012. Since the engineering student population is the largest in Hanyang University, the program was first piloted only in two major departments of the college of engineering and then extended to the other majors.

1) Stage One (2007-2008)

During the first stage of the development, H-TOPS course requirements for certification were elicited. It started from student needs assessment through personal interviews and surveys. At the beginning of the research, the development committee had an assumption that the students needed to learn professional terms that are used in their major fields in English and to understand organizational structures that are frequently adopted in engineering writing.

However, the student interviews and surveys revealed that the majority of the engineering students seek to get jobs instead of furthering their study in graduate schools, in which case, oral presentation and problem solving skills were more of their major concerns than the academic writing skills. As a result, the course was driven more towards the oral presentation skill development, but did not exclude academic writing skills completely from the course. Instead, a tutorial system in addition to the regular class hours was adopted to provide individualized feedback.

Through the two-semester long pilot program running and investigations, the H-TOPS development committee consolidated the course requirements as follows:

    a. Three oral presentations on given topics: students make oral presentations on the given topics from the course textbook. In the process of preparation for the presentations, students should conduct research on the given topics, share the information with their classmates through classroom discussions, analyze the problems the current engineering markets have, and suggest creative solutions to the problems and/or report their implications.

    b. Three essays on selected topics: students write five-paragraph essays on the topics they withdraw from those they have made presentations on. Since the essay writing is a new skill development for most of the students, the first essay may be written collaboratively with their teachers and classmates, in which case, only the two essays independently written are to be evaluated.

    c. Portfolio: students submit a portfolio which illustrates their learning process. The portfolio includes;1) goal statement, which they establish at the beginning of the course through consultation with their teachers, 2) an organized list of documents that demonstrate their progress and achievements in their learning, and finally, 3) reflective statements on their learning, in which students reflect on their learning process and evaluate their own achievements and make plans for their future learning.

The course evaluation made at the end of the development Stage One turned out to be successful, and as a result, the course was to be extended to the other majors.

2) Stage Two (2009-2010)

In the second stage of the development, a textbook was going to be developed for the course. During Stage One, a commercial textbook titled "English for Science and Engineering by Thomson (William, 2007)" was utilized. The textbook was selected for this course initially because of its design: each unit (of the five in total) has a theme in relation to engineering; students are exposed to a variety of work situations in the engineering related fields; at the end of each unit, students are supposed to use the knowledge covered in the unit and perform given tasks. These features of the textbook appeared most appropriate for the course requirements among the other commercial textbooks.

However, although the textbook covers multiple engineering topics, it does not deal with academic writing or oral presentation skills that are required in this course. The tasks assigned in each unit of the textbook are also beyond the range of the college students' interests. Besides, the number of the units in the textbook is not well coordinated with the number of class weeks in Korean universities, which makes it hard for the teachers to manage. Therefore, a separate workbook was developed with the tasks that are more appealing to the college students of Korea along with step-by-step writing and oral presentation guidelines.

In order to develop a textbook that is more suitable for Korean college semesters as well as more cost-effective, the development committee outlined a textbook based on the class activities and themes previously taught. The textbook will include the task-based activities on engineering topics, which were the main content of the commercial textbook currently in use. The language skills such as academic writing and oral presentation skills, which consist of the H-TOPS workbook will also be included.

3) Stage Three (2011-2012)

Stage Three is the final year of the development project. In this stage, the ultimate goal of the course, H-TOPS test development will be completed. As mentioned earlier in the Course Objectives, the assessment form is the integral part of the learning in an EFL class. Also, the development of this certification program can be completed only when a legitimate test that provides objective criteria for certification is constructed.

Currently, the portfolio evaluation which includes all the student work (three oral presentations and two/three essays) along with the learning reflections throughout the semester is the major assessment form. Although the portfolio is considered as an authentic and comprehensive form of assessment to evaluate students' knowledge and skills, it lacks in practicality because a holistic scoring or single-number evaluation is required in the school system. Also, portfolio evaluation has its pitfall in that it cannot be completely free of the teacher's personal judgment.

Therefore, a more objective and yet still comprehensive form of assessment needs to be devised. The development committee piloted such tests earlier in Stage One. In addition to the portfolios the teachers evaluate at the end of the semester, a speaking and writing test was conducted online. It used the iBT TOEFL testing tool provided by Language Services, Ltd. in Korea. The students' performances were evaluated by a credited rater outside the school. The test questions were written by the H-TOPS teachers asking the students to perform four speaking and writing tasks (two questions for each speaking and writing) on the similar topics that were covered during the semester.

The online test results for the two semesters of the pilot period were only partially utilized in the actual assessment because the validity of the test was yet to be more researched. Further research on the online test validity is currently withheld due to the administrative and fiscal change in the project.

III. Course Curriculum

1. Overview

The H-TOPS course is designed to be offered for two hours to the second-year students of engineering college. It is a six-hour and 3-credit mandatory course (currently, elective) for those who seek for the ABEEK certification. There are two components in the course: oral presentation and academic writing. For each semester, students perform three

oral presentations and three academic essay writings on engineering related topics.

Out of the six hours of class, four hours are spent on classroom activities mainly focusing on the oral presentation and the preparatory activities of the essay writing. The rest two hours are set aside for the tutorial sessions during which the teachers meet with their students individually to provide feedback on the outlines of the presentations and the essays the students have written.

2. Class Objectives

The educational principle underlying in H-TOPS course is that language acquisition occurs when the learners use the target language for authentic needs (Hutchinson & Waters, 1987). In this vein, the course requires the students to develop creative problem solving skills. For this, the students perform various tasks by investigating and analyzing engineering topics as well as developing solutions. Throughout the whole process of task performances, students gain clear understanding of the organic mechanism of the workplaces of their future, and enhance interpersonal skills by developing communication and negotiation skills. The students' communication and negotiation skills are systematically supported by language skill development such as learning academic forms and structures of the language that are used in formal oral presentations and essays. The expected course outcome is that students are able to write academic reports, participate in discussions and make oral presentations in English on their major topics.

3. Class Organization and Management

The class is composed of three modules each semester with one particular theme in each module. Speaking and writing skills are successively covered on the common theme in a 3 to 4 week long module. The learning goals and the language skills focused in the three modules of Semester 1 are as follows:

Table 1: Course syllabus

Modules	Goals	Skill Focus	Tasks
I **(Week 1-4)**	Students understand the significant role of R&D department in an industry and learn how to plan projects.	- Getting ready to write - Understanding the paragraph structure - Preparing a presentation - Developing physical messages (voice, body language..)	Students investigate 1) how scientific research is conducted and supported in Korea; 2) how scientific research and industrial advancement are related.
II **(Week 5-10)**	Students study current trends in industrial design and learn the concept of "value engineering".	- Descriptive essay writing - Revising - Developing story messages (introduction, body, conclusion)	1) Students analyze strengths and weaknesses of an existing household product based on "value engineering." 2) Students devise solutions to the weaknesses and develop a new design of the product they have analyzed.
III **(Week11-15)**	Students understand how the industrial engineers with different expertise work together and learn how to describe engineering tasks in layperson's term.	- Process essay writing - Using cohesive devices - Developing visual messages(creating and using visual aids)	1) Students illustrate marketable functions of the newly designed product of Module II; 2) explain a technical engineering or manufacturing process of one of the functions.

During the two two-hour classes every week, students gain clear understanding of the given theme of the module in session, gather information on the topics through research and discussions and plan their presentations. In the next step of the class, students practice and review their presentations through small group and large group discussions and feedback, and finally, make presentations for the assessment. In the mean time, students often meet with their teachers and get advice and assistance they need through tutorials, which are two-hour sessions weekly assigned in addition to the regular class hours.

After the oral presentation task is completed, students work on their essays. They follow the steps of the writing process: brainstorming → outlining→ writing 1st draft→ revising→ writing 2nd, 3rd … draft → submitting final draft. For the writing task, only the brainstorming and outlining stages are covered during the class hours. As for the review of the 1st draft and the rest of the writing process are all covered through tutorial sessions.

During the course, students keep a record of each step of the task so that they can review the documents to reflect on their learning process. The record encompasses their notes, outlines, revisions, feedback and self-evaluations on the tasks they have performed. At the end of the course, students select the documents that reflect their learning process and organize them systematically in their portfolios to demonstrate their achievements throughout the course.

IV. Outcomes

The H-TOPS course outcomes may be assessed through two mediums. One is through the teachers' observations of the student performances at the beginning, in the middle and at the end of the course. The teachers reported that the students expressed the coursework was demanding but greatly rewarding. In the beginning of the course, the student performances were not well organized or efficiently presented because the students did not have adequate background knowledge or language skills. However, the students learned how to extend their knowledge, to organize their ideas logically and to deliver their messages clearly and efficiently through the coursework. As a result, the students demonstrated steady progress at every assessment made at the end of each module.

The other is through the students' reflective statements on their learning and self-evaluations made in their final portfolios. In their portfolios, the students analyze their strengths and weaknesses they have at the beginning, in the middle and at the end of the course, which depicts their learning process and the progress they have made. In such analyses and reflections, many students have referred to positive outcomes of the course. The following are a few examples.

"Through this course, I could improve my oral presentation skills and essay writing in English. This helped me succeed in job interviews." (Chi-woong Yoon, mechanical engineering major, 2007) Yoon mentioned in his portfolio that since he got used to organizing ideas and speaking English through the coursework, he could make logical responses to the interview questions.

Another student Hyun-min Lee majoring in advanced materials stated that the H-TOPS course was a good learning opportunity not only to improve his English skills but also to extend his knowledge especially on world economies. His teacher commented on his performances regarding his strong interest in the topic research during the course. "Hyunmin's presentations were always well supported with the legitimate details that he obtained through comprehensive research on the topics." (Kathryn McMorrow, H-TOPS instructor, 2007)

Shariman Effendi, a sophomore student majoring in computer science and communication reported that he had built on confidence in making formal presentations before large audience. He further noted that he was able to organize his ideas logically after having performed the oral presentation and writing tasks required in the course.

V. Conclusion

H-TOPS, an English course specialized for engineering students at Hanyang University, was initiated to bring up the engineering students as the intellectual assets required in the 21st century. Under the five-year development project, H-TOPS committee designed a course to train the engineering students to gain professional knowledge competence, interpersonal and communicative competences.   The course fundamentals including course objectives and two-semester curriculum were developed through Stage One and half period of Stage Two. A textbook and the testing tool appropriate for the Korean school system are still under development, but the results from the pilot program running during Stage One demonstrate a high potential for positive outcomes on their completion.

The teachers' course evaluations and the students' reflective statements on their learning indicated that the constant development of the H-TOPS course would greatly benefit the engineering students to be successful in their future career.

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