

Women in Engineering Subject and Education

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ABSTRACT

Women in engineering subject were developed for women included engineering education in Korea. Women in the predominantly male-oriented college of engineering which is afflicted by the high dropout rate and the low employment rate of coeds in their majoring fields because of the die-hard male dominant culture. In order to resolve the related problems, Our University has been actively engaged in a movement called "Women into Engineering" (WIE) to raise the gender cognitive awareness and to train women engineers for highly qualified work force. As part of the movement, a subject called "Women in Engineering" that focuses on the gender cognitive perspective is effective to reduce the dropout rate and to land a job inside their fields by stimulating their interest in their specialty made soft/hard skills.

The study was conducted a survey of the coeds who have completed the "Women in Engineering" course to evaluate the degree of satisfaction perceived, and a t-test through comparing the group of the coeds and a group of coeds who have not taken the course. The results showed statistically significant responses indicating that both groups of coeds would like to see WIE offer more basic engineering courses like "Women in Engineering.". This may lay the foundation to offer other major engineering courses for juniors and seniors that emphasize the gender cognitive approach.

Keywords: Women in Engineering, Engineering subject, female engineering

I. Introduction

One of the most important growth engineering industries for the next generation is highly-skilled manpower. Since a half of the national population can be female human resources, nurturing female engineers is a very important task.(Youn, J. T. et al., 2011) Additionally, manufacturing products well appealing to women is also important as more than 50% of domestic consumers are female. Universities have so far tried to offer gender-cognitive perspective by introducing various female related subjects including women's studies. It contributed to the elimination of patriarchy and promotion of gender equality education.(Min, H. J. et al., 2009) However, 73% of the engineering majors are male in our University known to have the highest number of female students in Korea. On top of that, the female entry rate into the engineering field remains at a mere 50%.(Park, S. H. et al., 2008) Aggressively

competing with males already dominant in the engineering field was regarded as the only way to increase the female employment rate as long as the number of jobs stays still. However, with the emergence of 'alpha girls' and female emotional engineering that will lead the industries in the future, more females should advance into engineering to create emotional business strategies and blue ocean strategies. In line with that, new female engineering subject were introduced and lectured.(Song, I. J. et al., 2007) And the achievement of the subject was analyzed by conducting a lecture evaluation and surveys and tracking careers of female engineering majors.

Until the 1960s, the main industry was the male-dominant primary industry where most of the operation was done by manpower. However, in this modern society, the tertiary industry where emotional engineering plays an important role became the mainstream.(Shin, S. M. et al., 2006) Therefore, introducing new subjects related to female engineering and promoting university education in the sector became important.

This dissertation aims to mention the necessity of studies that can be a basis of gender-cognitive engineering education.(Youn,

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J. T. et al., 2009) Another goal is to develop and disseminate cultural subjects for engineering majors to nurture highly-skilled female engineers by teaching the female students an emotional engineering approach in their career planning.

II. Existing female related subjects

Before setting up new subjects, the existing subjects that can teach female engineering majors the role of female and their future career direction were surveyed. Most of the female subjects in universities can be divided into the

Table 1 Women related subjects being taught in universities in Korea

Subject Title	University	Department
Women and the Law	Korea	All departments
Women and Politics	Kyunghee	Political Science and Diplomacy
Women and the Economy	Korea	Cultural Studies
Women's Right and Protection	Dongguk	Cultural Studies
Women and Society	Seoul Nat'l	Cultural Studies
Women's Welfare	Sungkyunkwan	Women's Studies Major
Women's Policy	Ewha W.	Public Administration
Women's Employment	Seogang	Women's Studies Major
Women & Literature	Seoul Nat'l	German Language& Literature
Women & Media	Sookmyung W.	Information and Broadcasting Major
Women & Psychology	Myongji	Cultural Studies
Women's Studies	Yonsei	Cultural Studies
Introduction to Women's Studies	Korea	Cultural Studies
Understanding Women's Studies	Kyungpook Nat'l	Cultural Studies
Women's Leadership	Hankook Univ. of Foreign Studies	Special Cultural Studies
Women and successful Employment Strategy	Chungnam Nat'l	Cultural Studies
Elite Women's Leadership	Sungshin W.	Outside Training Course
Female Engineer and Leadership	Sungkyunkwan	Cultural Studies
Female Engineer and Expertise	Ewha W.	Engineering Majors

following three categories. The first category includes 'Women's Studies' focusing on feminism and gender equality, 'Women and The law' that can enhance women's right, 'Women and Politics', 'Women and The economy', 'Women's Right', 'Women and Society', 'Women's Welfare', 'Women's Policy' and 'Women's Employment'. (Youn, J. T. et al., 2009)

The second category includes 'women and literature' with a psychological approach of women, 'women and media' and 'women and psychology'. The third category includes 'women and engineering', and 'women and technology' which hold significance. Related 'women and leadership' and 'women's career exploration' are also considered significant. However, there are no suitable books for female engineering majors in Korea.(Lee, E. A. et al., 2006) Planning and conducting lectures are mostly done by outside lecturers. Considering such circumstances, (Jung, H. S. et al., 2001) we introduced new subjects for female engineering majors, developed books and sought ways to offer female students a future direction.

III. Female Engineering Subjects Developed

The newly developed 'Female Engineering' was a two-hour class with two credits. The aim of the class is the following: first, teaching the difference between 'Gender' and 'Sex', and their definitions; second, helping female engineering majors collect, organize and analyze basic knowledge; third, motivating female students to study on successful cases of female engineers and build up their own capacity and vision by using the data; fourth, building up female students' ability to collect, analyze, listen to, present data and make a report; fifth, emphasizing the utilization of female manpower as one of the next generation growth engines.(Joo, J. S., 2007) In other words, the overall goal of the class is to help female students have a clear vision of their engineering majors by encouraging them to advance into the engineering field and contributing to the national industrial growth.

The lecture focused on making the students understand the current status, role and prospect of female engineering majors in and abroad. It also emphasized the gender-cognitive perspective on female engineering education. Boosting interests of female engineer majors in their majors by teaching the relations among the majors was another focus of the

lecture.(Deleuze,G., 2004) It also promoted successful entry of females into the engineering field. The lecture was designed to eliminate the existing concept that female engineering divides engineering education into female education and male education.(Hong, M. N., 2007) When providing career planning education, universities tried to consider gender cognitive perspectives and eliminate gender discrimination though there is a biological and emotional difference.(Hong, S. A., 2009) The lecture was conducted along with discussion, presentation, on-the-spot study and invitation lecture to introduce successful contribution cases of skilled female engineers to the society and industries, and help the students develop themselves. The lecture was monitored and improved through pre and post surveys. Presentation score accounted for 10% of the total score to encourage asking questions and presenting opinions during the lecture. Assignment and attendance accounted for 80% and 10% respectively of the total score.(Hong, J. Y., 2009) When the lecture was first introduced, not many students took a course as they were not informed well of the contents. Therefore, lecture plans and contents were advertised through web sites or bulletin boards. Frequent invitation lectures might distract students away from the focus of the lecture.(Hatch, S. E., 2006) During the lecture, we allowed students to get the sense of the working field by inviting successful entrepreneurs or seniors to give a lecture of 30 to 60 minutes. Unlike major subjects, cultural studies easily fail to continuously grab the students' attention during the class.

Therefore, discussion and evaluation based on presentation performance were adopted to bring about voluntary participation and interests of the students. With consultations with outside organization such as Business Women's Association, CEOs and experts were invited to give a lecture on gender cognitive education.(Myers, D. D., 2008) With the signing of MOU with Korea IT Business Women's Association, invitation lecturers for one semester were selected in advance.

Evaluation method was designed to encourage the submission of various types of reports. To enhance presentation skills, create motivation and build up leadership of students, (Rounaq, J., 2009) reports were submitted in audio file and video scripts. Males and females were given enough time to discuss with each other, and the qualification of the discussion was evaluated in 10 levels.

Table 2. Syllabus of “Women in Engineering” course

Week	Title	Content.
1	Introduction to Women in Engineering	Introducing related materials
2	Definition of Engineering	Optimization Process
3	Gender Engineering	Introduction of Emotional Engineering
4	Gender-Cognitive Concept & Boosting Power	Invitation Lecture
5	Current Status of Female Engineers In & Abroad	WIST Report
6	Social Role of Female Engineers	Data from the Ministry of Knowledge Economy
7	Obstacles of Female Engineers	Data related to the Ministry of Gender Equality
8	Female Blue Ocean Strategy	Case Study
9	Feminist & Alpha girl	Case Study
10	Gender communication	Case Study
11	Women leadership	Invitation Lecture
12	Emotional Business Strategy	Case Study
13	Future of Female Engineers	Student Presentation

Analysis of the lecture was done by conducting pre and post surveys. The feedback data was used to enhance the lecture quality. A new textbook is developed and scheduled to be published. Lecturers were also allowed to use fast changing statistics and internet data. The lecture was designed to give internet-savvy students an accurate concept of gender-sensitive perspectives.(United Nations, 1997) Each chapter of the book selected female as a team leader or an expert, and presented discussion topics with which female students should play a leading role. It also encourages females to lead team activities such as presiding meetings. When it comes to male students, the book aims to remove the prejudice against female students. As for female students, it offers an opportunity to renew their understanding of gender role and build self-leading learning skills and leadership.

IV. Operation Results Of The Female Engineering Subject

Survey was done before and after the lecture in the form of both subjective and objective questions. Table 3 is the result of survey after the lecture. The question was 'Is this course useful to women and man engineers both?' 94.1% of the students who took the course responded positively.

Table 3 This course is useful to women and man engineers both

division	Frequency of people	Rate(%)
Very satisfied	18	52.9
satisfied	14	41.2
Average	2	6.9
dissatisfied	-	-
Very dissatisfied	-	-

Table 4 Satisfaction of this course for students after lecturing

division	Frequency of people	Rate(%)
Very satisfied	14	41.2
satisfied	17	50.0
Average	8	8.8
dissatisfied	-	-
Very dissatisfied	-	-

Also the question was 'Is the Satisfaction of this course for students after lecturing?' 91.2% of the students who took the course responded positively.

During the lecture evaluation in the form of subjective question, students were asked to write their thoughts on what satisfied and dissatisfied them during the female engineering lecture. According to the responses, the lecture was successful. Below is the summary of the most common responses.

- I got to understand the concept of gender-cognitive engineering education. It made me proud of studying engineering as a female.
- Through the invitation lectures, I realized there are many successful senior engineers. That motivated me to challenge.
- I got to think more seriously about my major and be proud of it.
- It was encouraging to study and compete with other engineering majors.
- It was unusual and fresh to learn from various lecturers thanks to the invitation lectures.
- It seems there is a limit in obtaining practical information appropriate for each department.

Related to the 'Women and Engineering' course developed, almost 2000 subjects (as of January 2008) were introduced in Pukyong University over one semester. One of them received the 'Best Lecture' award based on the results of lecture evaluation.

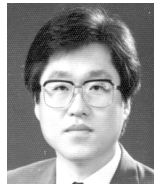
V. Conclusion

The new subject was developed to provide gender-cognitive engineering education. In addition, the lecture was established to teach female engineering majors an emotional engineering approach in deciding their future careers. As a result, the subject was proved to induce interests in engineering from female students. It also helped them advance into the engineering fields. With the female emotional engineering approach, coexistence and communication rather than competition with males were emphasized. It also received favorable comments from the students. Therefore, it will be great to adopt 'Women and Engineering' as one of the cultural studies for all engineering majors. We hope the subject will be spread to other universities to generate more highly-skilled female engineers in Korea.

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