

**Harmonious Combination of Tradition and Innovation
– Making a Connection between Liberal Arts and Technical Courses, and
East and West–**

Yuko Hoshino, L. Wayne Sanders

Kanazawa Institute of Technology/Rose-Hulman Institute of Technology

Abstract

This paper is the result of collaboration between a foreign language and cultural studies professor in Japan and an engineering professor in the United States. It discusses a case study of the similarities between foreign language study and engineering courses at a private engineering college in Japan. Project study in a Chinese language course was conducted using the same methodology developed for engineering design courses. This methodology is easy for the students to follow, and reinforces the course goals in the language course by using acquired skills from engineering design to solve problems. In selecting a project in engineering design, the student must decide if the project can be finished in the given time frame. These same criteria can be applied to selecting a language project. Also, availability of information is a necessary question to be answered before selecting a project in either field.

An open audit policy of the language course made it easy for non-traditional students to participate and for traditional students to gain experience and insights into working with people with different backgrounds. This corresponds to working with groups in engineering design where the members have different backgrounds. The presentation of the language project work was open to the public and promoted outside feedback, just as in engineering design.

1 Background

Kanazawa Institute of Technology (KIT) is a private college in Kanazawa, Japan and has three departments - engineering, environmental studies and architecture, and information science. It receives approximately 1500 to 1650 undergraduate students and 200 graduate students each year. The City of Kanazawa is located facing the Sea of Japan and can be reached by a 4.5 hour train ride, or 50 minute flight, from Tokyo. Although students come from all parts of Japan, most students come from nearby regions.

The college's curriculum starts with preparatory courses in mathematics, physics, chemistry, and engineering, along with required liberal arts courses in the first year, and then proceeds to more specific engineering courses. As for foreign language study, English is mandatory but German and Chinese may be taken as electives. KIT was the first college in Japan to introduce engineering design (ED) education based on courses taught in the United States. It has become an essential part of the college's curriculum.⁽¹⁾ All students are required to take engineering design I, II, and III. Engineering design is taught in the fall term of the freshman year, the winter term of the sophomore year, and all quarters of the senior year. KIT is on the quarter system. The spring quarter is the first term of each year as shown in Table 1.

Table 1 Engineering Design (ED) in the KIT curriculum

Term/Year	Spring* (April-June)	Summer (July, Aug.)	Fall (Aug. – Nov.)	Winter (Nov.-Mar.)
Freshman			EDI	
Sophomore				EDII
Junior				Seminar**
Senior	EDIII (senior project)	EDIII	EDIII	EDIII

*Academic year starts in April and ends in March in Japan

**Seminars are intended to have students familiarize themselves with their choice of seminar projects and their advisors. Seminars and EDIII classes are held by the same senior project advisors. Size of the seminars and EDIII classes varies from 2 students to 20+ students. EDI and EDII classes usually have approximately 30 students.

2 Problems identified

Since the introduction of engineering design education at KIT, some problems have been identified.

2-1 Relevance among courses

By analyzing students' course evaluations, it can be determined that they feel there is little or no similarities among methodologies used in courses, even within technical courses.⁽²⁾ One course teaches technical report writing skills or group work techniques, but other courses do not necessarily reinforce them, and so forth. Faculty members tend to not discuss what and how they teach with other faculty unless they teach exactly the same course. Because the skills students learn in one course are not repeated or reinforced in other courses, they forget and lose these skills quickly.

2-2 Relevance to real world

In Japan, college classrooms are usually occupied by “traditional” students. They are between 18 and 22 years of age. Occasionally the age range may reach 25 depending on the number of years spent at preparatory or cram schools before college. Most of the students have come straight from high school and have no working experiences other than some part-time work. Due to this lack of real world experiences, students have difficulties relating their course work to actual problems existing in society.

2-3 Critical atmospheres in the classroom

Educators in Japan have been placing their priorities in education on accuracy and preciseness, rather than on critical thinking or originality.⁽³⁾ This attitude is changing but still remains at many educational institutions. It discourages students from expressing their thoughts and ideas. If they do, they are likely to receive criticism for their mistakes.

2-4 Passive attitudes

Students’ generally have a passive attitude towards learning. This can be attributed to their education before reaching the college level. Traditionally, teachers talk and students listen. Questions and comments are not encouraged. In that environment, students learn to only receive knowledge which teachers select rather than actively seeking the knowledge they want or need.

3 Responses to the problems

3-1 Making connections between different courses

The authors attempted to assimilate information from an ED course (EDII) and one of the language courses. Chinese was selected for this study. Elective courses in foreign language are offered only after students finish the required English courses, English I to V. By the time many of them fulfilled their requirement courses in English, they have also finished EDII.

Table 2 Foreign Language Courses at KIT in relation to ED curriculum

Term/Year	Spring (April-June)	Summer (July, Aug.)	Fall (Aug. – Nov.)	Winter (Nov.-Mar.)
Freshman	Placement English	Intensive English*	English I, II, III EDI	English II, III, IV
Sophomore	English III, IV, V	Intensive English	Chinese I German I	Chinese II German II EDII

*“Proceedings of the 2005 American Society for Engineering Education Annual Conference & Exposition
Copyright ©2005 American Society for Engineering Education”*

Junior	Chinese III (project work) German III			Seminar
Senior	EDIII (senior project)	EDIII	EDIII	EDIII

(This table is applicable to students who entered the college by the spring term of 2003. KIT started new curriculum in spring of 2004 in which Chinese and German courses no longer have English as a pre-requisite. Students who entered KIT after year 2004 can take these two language courses anytime.)

In order to show students that their acquired skills in ED I and II can be applied to problems in other subjects, the same method used in ED II for project theme selection was used for theme selection for Chinese III project. The criteria for ED II theme selection are listed in Table 3.

Table 3 ED Project Theme Selection Criteria

Criteria (give point 1-5) /Theme:	1	2	3	4
Possibility of improvement				
Availability of technology				
Possibility of meeting specification				
Feasibility in given time frame				
Feasibility in technical level				
Availability of information				
Total point				

There are criteria for:

1 Possibility of improvement: to see if the theme would enable improvement in existing product design

2 Availability of technology: to determine if the necessary technology needed to create the design is available to students

3 Possibility of meeting specification: to see if their theme can meet the product specification

4 Feasibility in given time frame: to determine if the design can be finished within a given time

5 Feasibility in technology level: to determine if the design can be created with students' level of expertise

6 Availability of information: to see if necessary information to create the design can be obtained

*"Proceedings of the 2005 American Society for Engineering Education Annual Conference & Exposition
Copyright ©2005 American Society for Engineering Education"*

In comparison, criteria for Chinese project theme selection are shown in Table 4.

Table 4 Chinese Project Theme Selection Criteria

Criteria (give point 1-5) /Theme:	1	2	3	4
Originality/Creativity				
Availability of equipment				
Feasibility in given time frames				
Feasibility in language level				
Availability of information				
Total point				

There are criteria for:

1 Originality/Creativity: to determine if the theme has some originality or how creative are the students' ideas. Compare to criterion 1 of possibility of improvement in ED theme selection, considerations for originality and creativity are required for project work in foreign language.

2 Availability of equipment: to decide if their theme can be achieved and presented with existing equipment, such as computer, projector, audio player, and so forth. This is equivalent to the ED criterion 2 for availability of technology.

3 Feasibility in given time frames: same as the ED criterion 4

4 Feasibility in language level: to decide if the theme can be presented by students and be understood by fellow students without too much difficulty in grammar, vocabulary, and the like.

5 Availability of information: same as the ED criterion 6

Criterion 3 in ED theme selection for possibility of meeting specification is omitted for there is no specification for language project work.

The students form groups of two to five members and for each theme give point values from 1 to 5 to each criterion. The project theme which receives the highest point total will be chosen. Because this method is more objective than simply discussing the themes proposed by members of the group and then selecting one, the selection process usually only takes a short time. Moreover, students rarely change their theme after they started working. This is probably due to the fact that it is clear to the members of the group that they have chosen the best possible theme at that point.

Students have come up with a wide range of themes and have chosen their themes based on these criteria. Examples of the themes for Chinese project work in the past are shown in *“Proceedings of the 2005 American Society for Engineering Education Annual Conference & Exposition Copyright ©2005 American Society for Engineering Education”*

Table 5.

Table 5 Themes of Chinese project work

Category	Theme
Major related	Theory of amplifier (electric engineering major)
	Buildings of Su Zhou and Venice (Architecture major)
History	History of Chinese characters
	Tale of 3 kingdoms
	Origin of Chinese medicine
Target (Chinese) culture	Costume of China
	Chinese cuisine
	Traditional life style of minority of China
	Chinese wedding
	Chinese new year
	Chinese martial arts
Own culture	Japanese cuisine
	Animation of Japan (translated and superimposed)
Own environment	KIT
	Kenrokuen garden* in Kanazawa

*One of three most praised gardens in Japan.

3-2 Making classes open to all who want to attend

To create a class that is as close to a work place as possible, non-traditional – older people with different backgrounds and life-experiences – are welcome. Those are the people who teach as faculty, who work as staff members, and who came to know about the course. They come and sit in the class when they can. They can provide the regular students their perspectives, interests, skills, and strategies. Students are generally quite inspired by them. It can also serve as an excellent example for life-long learning for students see that even professors with terminal degrees and working people are still trying to learn.



Fig 1 and 2 Faculty and graduate students attending classes with regular students

3-3 Making the class atmosphere as non-judgmental as possible

Being non-judgmental may not sound new to many Western educators, but it is still quite a new concept for many Japanese educators. In this Chinese project work class, the instructor acts as “Senpai” (Japanese term for those who started before you do and thus, are more knowledgeable and skillful. It can roughly be translated as “mentor.”), facilitating learning instead of transferring knowledge as traditionally vied as teachers’ role in Japan. For example, when asked questions, the instructor points out the ways to apply learned knowledge to form sentences in Chinese rather than giving the inquirer answers. Also, due to the wide range of themes, the instructor may not know the answers. However, as Senpai with more experiences and strategies on how to get by with the language, the instructor can work with students to find answers. Moreover, students can help and teach each other some of the time. The outcome is sometimes more effective than the instructor helping them. It might be due to the fact that students feel more pressure to become competent when fellow students teach them.

Grading for the course is to nurture the sense of accomplishment. Therefore, completion of the projects is of the utmost importance. After only two terms (thirty six hours) of instruction, doing anything with a foreign language is challenging enough. The students in the course receive at least passing grades and are given much oral encouragement to complete the final presentations of their project.

3-4 Making students responsible for their learning

By making students responsible for their own learning, they start directing their own work process. They identify what they need in order to present their project – necessary vocabulary, grammatical knowledge, pronunciation, and skills to present their project well. Here, the instructor’s role should be small, helping students if they ask, but mostly just

reminding them that they already have the necessary skills. What is needed is to remind them that they have the knowledge and skills required to get the job done.



Fig 3 Working on their projects



Fig 4 Instructor going around to help students



Fig 5 and 6 Presentations

4 Students' feedback

The students' comments were generally quite positive. Some were excited to have found the relevance between technical courses and non-technical courses. They expressed it as "I never realized until now that I could apply the same methodology to other problems."⁽⁴⁾

Assimilating two courses helps to achieve both courses' objectives.

Some students gained enough confidence that they went on to re-study English, which many had failed or done poorly in previously. They now felt they knew how to learn and teach themselves foreign languages.

5 Suggestions

1 Faculty and schools in Japan should create a non-judgmental atmosphere and openly discuss what and how they teach their classes and how best to exchange ideas with students. This is necessary for the students' – the future generations' – benefit. This may also produce other attempts to assimilate different courses' methodologies. This time it was easy because the discussions were between Japanese faculty and American faculty. It might be wise for Japanese faculty to approach visiting scholars with open attitudes and expand on what has been started.

2 It is recommended that faculty work with non-academic people to develop class content and methodologies for close to real life practices and problems.

3 Educators in Japan should shift their classes from teacher-centered oriented to student-centered. This would allow students to become their own teachers. In other words, teachers should put some of the learning responsibility on the learners themselves.

4 Educators should give students encouragement and praise when possible and criticism only when absolutely necessary. It has been a traditional attitude for teachers in Japan to correct students' mistakes and push them to be mistake-free learners. This causes many students to adopt a low self esteem attitude. In order to motivate them to learn more, praise works better than criticism.

Bibliography

- 1 M. Matsuishi, Y. Hoshino, L. W. Sanders, "Evolution of Engineering Design Education at KIT" Proceedings of ASEE, 2003
- 2 Course evaluations, 1998, Kanazawa Institute of Technology, Japan
- 3 L. Hunter, "Informaps for Critical Thinking" working paper, JALT Conference, 2004
- 4 Course evaluations, 2000, Kanazawa Institute of Technology, Japan

Biographical Information

Yuko Hoshino

Education: Ph.D. candidate since 2003, 1994, M.A., Asian Studies, University of Oregon; 1980,

*"Proceedings of the 2005 American Society for Engineering Education Annual Conference & Exposition
Copyright ©2005 American Society for Engineering Education"*

B.S., Clinical Pharmacology, Kyoritsu College of Pharmacy. Professional Experience: 1980-87 in Industry; 1987-1989 and 1994-1996, Instructor, Harvard University; 1996-Present, Associate Professor of Foreign Languages, Kanazawa Institute of Technology

Dr. Wayne Sanders

Education: 1975, Ph.D., Mechanical Engineering, Southern Methodist University; 1970, M.E.S., Lamar University; 1960, B.S.M.E., Texas A & M University. Professional Experience: 1960-1969 in Industry; 1974-1980, Assistant Professor, Lamar University; 1980-Present, Professor of Mechanical Engineering, Rose-Hulman Institute of Technology.