報告

グローバル大学院プログラムにおける工学教育の新しい試み

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A New Approach on Engineering Education in Global Graduate School Program

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Abstract: The graduate school of The University of Tokushima aims to promote the graduate students in various fields of study and contribute to the improvement of the level of global education. For this reason, we are implementing new and innovative programs that help students develop their potential capacity. This work is series of monograph to improve the engineering education. The report presents the results and analysis of a survey given to the Center for International Cooperation in Engineering Education (CICEE) summer school participants; the summer school was held on August 3-7, 2009. The survey asked the participants about their summer school experience: their expectations, the long-term benefits of having participated in the summer school, their ideas for possibly improving the summer school. Both survey questions and answers are presented.
(Key Words: Global Education in Graduate school, Summer school program, Survey analysis)

1. Introduction of summer school course in global graduate school program:

There is a global need to promote international interaction, inter-cultural dialogue, intercultural understanding, and questions relating to the development of engineering education. The University of Tokushima (UT) has an extensive array of international contacts and co-operative experience in both research and education. The University of Tokushima is deeply committed to its International Partnerships; to improving Science and Engineering research together with other institutions of higher learning. The Double Degree Program as well as Student & Staff Exchanges, are some of the types of cooperation that have been successfully developed with partner universities. Also, in order to become a world-class university, one has to accept students from various countries, to form a multicultural university with an international community. The CICEE supports students from Tokushima University and 11 partner universities. This year, we wanted to continue to improve engineering education at the graduate-school level. As part of this improvement effort, the CICEE once again offered a summer school program, with courses from four disciplines: Nanotechnology Engineering, Electronics Engineering, Civil Engineering, and Information Science. The summer school presented graduate students with an opportunity for further, advanced, learning from experts in the four offered disciplines.

The main aims and objectives of the summer school course were as follows:

i. to provide students with an opportunity to explore a topic briefly, yet in depth.
ii. to promote interaction, in both research and education, between UT and its partners in the Double Degree program.
iii. to provide students with an intense, short-term, exposure to current happenings in engineering research.
iv. to provide an opportunity for communication between Japanese and Foreign students.
v. to experience the cultures of other countries.
vi. to give opportunities to student to discuss their research with colleagues and with experts in the field.

vii. to instruct courses using the English language. The 2009 summer school was jointly organized, by CICEE and UT. The event was held at UT on 3-7 August 2009. Again, Nanotechnology, Electronics and Environmental engineering, and Information Science were the disciplines featured at this year's school. The school was for 5 days, with classes meeting for 6 hours per day; the total course work was about 30 hours of instruction.

Details of the four offered courses are as follows**:**

I. Nanotechnology Engineering Course

i. Nanotechnology consisted of 17 lectures. Topics presented included Introduction of transparent and hard coatings, Material processing, Growth mechanism, and Characterization techniques used for nonmaterial, and its applications.

ii. The number of lecturers for this course was 17, from Japan, China, Korea and New Zealand.

iii. The total number of students enrolled was 32. The number of participants, from nine different institutes, was the highest of the four courses.

II. Applied Engineering of Electronics circuit course

i. The lectures covered 7 different topics. This course included different topics like Nonlinear electronics circuits, Semiconductor integrated circuits, and Pattern matching and its application.

ii. The number of lecturers was seven, from Japan and China.

iii. There were 18 students from three different institutes.

III. Civil Engineering Course :

i. This course offered lectures from five different topics. The course included topics such as Wind engineering, Earthquake engineering, and Seismic Soil foundation-structure interaction.

ii. The numbers of speaker were five, all from the University of Tokushima, Japan.

iii. The number of students for this course was 11, from four institutes.

IV. Information Science and Intelligent System Course

i. This course covered 10 different topics. The content from Information science and intelligent system included Quantum cryptography, Language structure, Multimedia and Information technologies, Programming for Pattern as well as Speech and Image recognition.

ii. The total number of participating students was 4, from 2 institutes.

iii. The number of speakers for this course was 10, all from The University of Tokushima.

As shown in table 1, a total of 67 students, from China, Korea, New Zealand, Taiwan, and Japan were present at the summer school,. 22 belonged to The University of Tokushima while 45 came from 9 other institutes from abroad ; participants were all graduate students of engineering. Thus majority of the participants were from UT's partner universities, in China, Korea, New Zealand and Taiwan.

The event provided a forum for teaching and learning, focusing on current research as well as possible future advances in the field of engineering. Of sixty-seven participating students, forty-one completed a survey at the end of the school. Forty speakers and lecturers, representing all the participating countries and universities, made presentations based on their research and work experience.

Out of the total survey respondents, 26 came from Nanotechnology, 11 were from Electronics and 4 were from Environment Engineering. The 2009 summer school can be viewed as a reflection of strengths and interests held in common between UT and its Double-Degree partners, especially so in those engineering disciplines where research interaction and collaboration have been on-going. Participating students gained valuable real-world experience, learned more about their chosen fields, and had an opportunity to network with professionals.

Table 1 : *Number of participants in the summer school and home universities*

Course	Location	Affiliation	Participants	Total
Nanotechnology Engineering Course	Japan	The University of Tokushima	7	32
	New Zealand	The University of Auckland	4	
	China	Xi'an Jiaotong University	4	
		Harbin Institute of Technology	3	
		Tongji University	1	
	Korea	Korea Maritime University	6	
		Pusan National University	2	
		Dong-eui University	3	
	Taiwan	Southern Taiwan University	2	
Applied Engineering of Electronics Circuit Course	Japan	The University of Tokushima	6	18
	China	Xi'an Jiaotong University	11	
		Tongji University	1	
Environment Control Engineering Course	Japan	The University of Tokushima	5	11
	China	Xi'an Jiaotong University	1	
		Tongji University	2	
	Korea	Korea Maritime University	3	
Information Science and Intelligent System Course	Japan	The University of Tokushima	4	06
	Korea	Korea Maritime University	2	
			Total	67

At the conclusion of the program, students were asked to complete a questionnaire. The survey was done to evaluate both learning and teaching. Too, the survey was intended as an investigative tool and to understand to what extent student expectations were fulfilled. Additionally, the survey allowed students an opportunity for reflection. Lastly, it was hoped that the survey results would provide the organizers with a chance to discover other, possibly unexpected, information and opinions from the participants.

2. Process for evaluation of the summer school program

All the participating students were presented with a survey. They were asked to answer questions about their expectations and their experience in the summer school. The survey was intended to be a way to evaluate students' experiences; it was also intended to provide a basis for, potentially, improving activities and programs that might be offered in the future.

Respondents were asked to indicate the degree to which they agreed or disagreed with statements, using

Figure 1 : *Participants to the summer school program*

this range of replies: 1=poor, 2=average, 3=good and 4=excellent. Other possible answers to the questions asked: “True” or “False”, “Satisfied” or “Not Satisfied”, “Like” or “Dislike”. Some questions allowed students to write comments freely; other questions asked for suggestions on how to improve summer school.

Students were informed that their responses would be used for the purpose of analysis and program evaluation. They were also told that no personal information would be published.

3. Expectations and the Summer school experience

The first question of the survey was, “Did your experience fulfill your expectation?” The majority of the respondents (93%) replied “yes”, to the question, as indicated in figure 2

Two participants (5%) answered negatively, and one (2%) did not answer. Thus, a large number of students indicated that the summer school program met their expectation, and would like the chance to attend future summer schools.

4. The Evaluation of Summer school choice of topics, and learning

4.1 The Evaluation of learning experience and lecture topics.

The survey asked participants to evaluate their learning experience and the lecture topics, as shown in figure 3. More than sixty percent of the participants (61%) stated that the choice of lecture topics was good; twenty-four percent (24%) indicated that the choice was excellent. Twelve (12%) of respondents stated they were dissatisfied about the lecture topics.

Forty-four percent (44 %) felt their learning experience had been good, while and 41 % respondents stated that their learning experience in the summer school was excellent. Approximately, 7 % of the respondents were dissatisfied with the quality of their learning experience.

4.2 The Evaluation of facilities and Program Organization

The next question asked about sleeping accommodations, classroom facilities and overall organization as shown in table 2. The students generally responded to this question positively, except

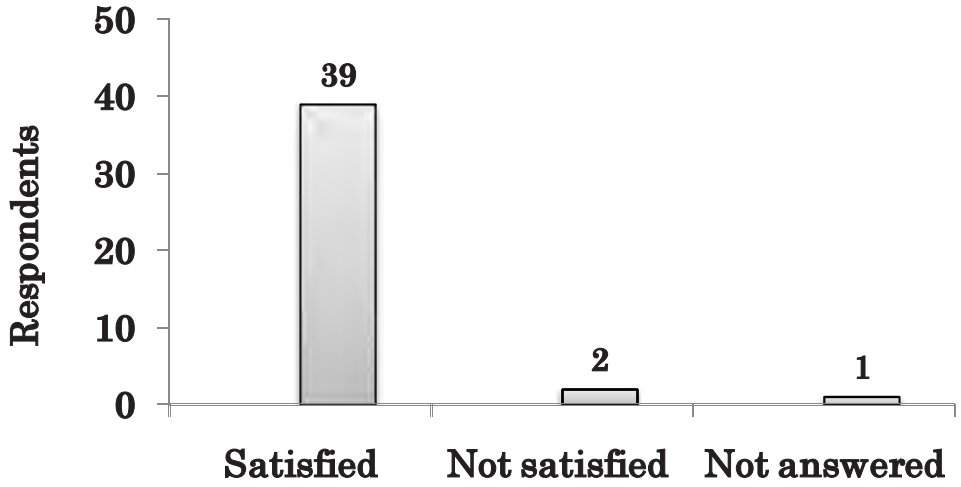

Figure 2: D*id your experience fulfill your expectations*

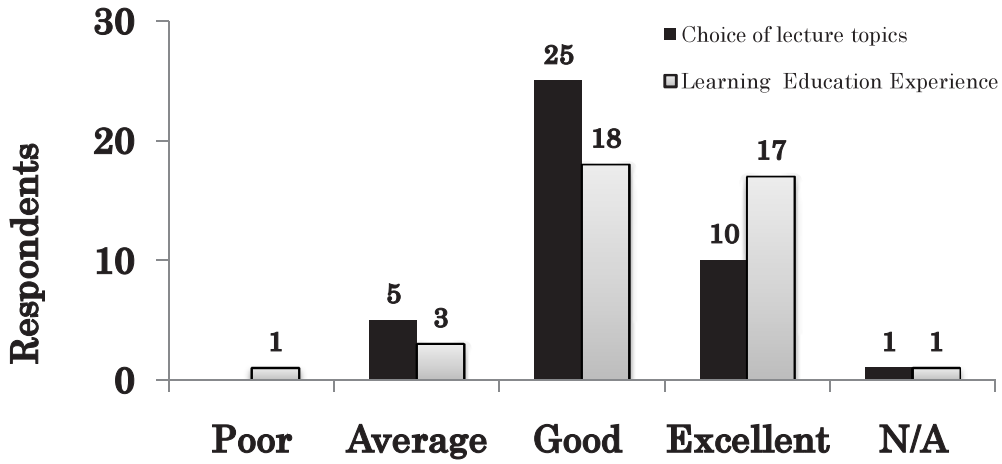

Figure 3 : *On a scale of 1-4, please rate the following aspects of the Summer School program (1=Poor. 2=Average. 3=Good. 4=Excellent, N/A=Not Answered)*

for individual remarks requesting better classroom facilities. Regarding sleeping accommodations, forty-six percent (46%) respondents rated them as good, thirty-nine percent (39%), excellent. Regarding the quality of classroom facilities, three-fourths (75%) of respondents said that the classrooms were either good or excellent. However, one-fourth of students (25%) were not happy with the classroom facilities. When asked about the overall organization of the program, forty-two percent (42%) rated organization as excellent; forty-two percent (42%) rated it good.

4.3 The Evaluation of lecture content and wish to join a similar program in the future

Students were asked a series of questions about the types of courses, lecture content or other learning experiences they might be interested in if they could attend summer school in 2010. The results can be seen in table 3. On the subject of lecture content, 95 % indicated that the content of the lectures was interesting and informative. 68 % of respondents agreed that sufficient time was allowed for them to talk and meet with other participants.

Interestingly, 29 % of the respondents stated that more time should be allowed for them to meet and talk. Nearly 95 % of the respondents expressed interest in a scheduled international experience and indicated that they would participate in such an event or activity, if a similar short-term program is offered to them in the future. The next question concerned the number of lectures: Was number of lectures appropriate or not? The majority of respondents (83%) chose “True”, 10 % replied chose the answer, “False”. 5 % of the respondents did not respond to any of these questions.

5. The Summer school experience

Students were asked about which aspects they “liked” (enjoy the most) and “disliked” about Summer school. Aspects students “liked” most about Summer school were fairly evenly distributed across several items (figure 4, and table 4). Generally, students liked the content of the lectures (44%), laboratory visits and field trips (39%), and meeting with other participants (5%). Furthermore, another 12 % of respondent liked various other specific characteristics of the program: the opening ceremony, learning scientific knowledge, and meeting with students from other countries.

Most of the respondents (41 %) stated that they were unable to think of anything they did not like. Other comments made in this section included: a need to promote communication between students (25%), too many lectures (7%), not pleased with course content (7%), the need to provide internet facilites (7%), and miscellaneous (12%). Along the same lines, dissatisfaction was expressed with a lack of interactive activities, need to reduce the number of lectures, more time for other activities, a need to improve the English abilities of some of the lecturers. A relatively high proportion of respondents referred to a lack of opportunities to communicate with other students.

Table 2 : *On a scale of 1-4, please rate the following aspects of the Summer School program (1=Poor. 2=Average. 3=Good. 4=Excellent.)*

	Respondent				
	Poor	Average	Good	Excellent	N/A
Sleeping accommodations	0	3	19	16	2
Classroom & other facilities	0	10	18	11	2
Overall organization	1	4	17	17	2

Table 3 : *Please answer the following questions by marking either T (true) or F (false).*

	Respondent		
	TRUE	FALSE	N/A
The content of the lectures was interesting and informative	38	1	2
Sufficient time was allowed to meet and talk with other program participants	27	12	2
If another similar short-term program was offered, I would participate again	38	1	2
The number of lectures was appropriate: not too many, not too few	34	4	2

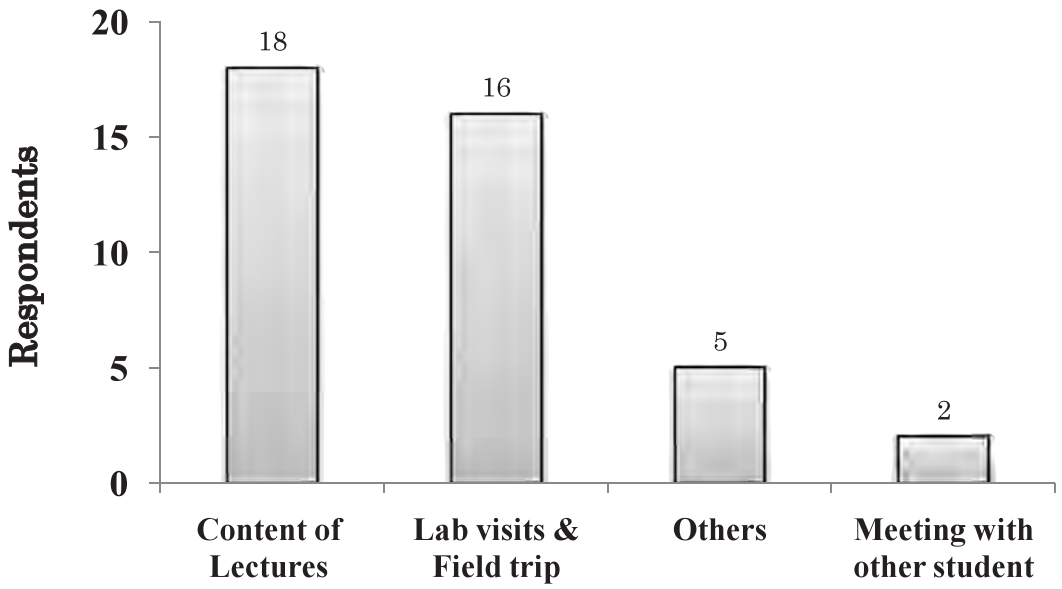

Figure 4 : *Which aspects of the program did you enjoy the most?*

Table 4 : *Are there any aspects of the program did you not like?*

	Respondent
None	17
Try to promote communication between students	5
Too many lecture	3
Content of lecture	3
Provide internet facility	3
Others	10

The summer school printed handouts are important; they are especially useful for students who are writing notes during the lecture; students are able to make notes on same page being addressed by the lecturer. Handouts can also serve as lasting reminders of important points from a presentation, and to support and illustrate the presentation as it occurs. Thus, the next question was, "*How useful were the information handouts?"*. A significantly large number of respondents (88 %) indicated that the handouts helped them to understand the subject content more easily, as presented in table 5. Nearly 7 % did not answer the question; 5 % said they couldn't find any information in the handouts.

6. Possible Summer School Improvement

Students provided important suggestions for the potential improvement of future summer schools, as shown in table 6. At least 34 % suggested a need to incorporate some practical experience into the program; they also asked for more laboratory tours and field trips. 27 % indicated a need for some interactive events, like a party or other similar social event, or an opportunity for meeting with others and practicing English. 12 % suggested a need to improve the accommodation facilities; 7 % expressed a need to reduce the number of lectures. 20% gave other suggestions: improve handouts, eliminate unnecessary lectures, allow students to attend other course lectures,

Table 5 : *How useful were the information handouts?*

	Respondent
I found the information useful and easy to understand.	36
The handouts didn't have the information I needed.	1
I didn't read the handouts.	0
I found the information difficult to understand.	0
I didn't receive any information handouts.	1
Not answered	3

Table 6 : *Do you have suggestions for how we might improve the program?*

	Respondent
Need for "hands on" or practical experiences, more tours of labs & field trips	14
Need for more interactive events (social events, learning English, meeting other people)	11
Negative comments about the housing	5
Too many lectures	3
others	8

a need for practical experience--like field work, a need for longer lunch breaks, and providing students more chances to improve their English abilities.

7. Summary and Conclusions:

Out of 67 registered participants 41 of them responded to the survey. The response rate may seem low but the number of responses was enough to analyze the program. The overall organization of the school seemed to be good: most respondents indicated that basic and necessary services were adequate and available. The survey results can be divided into four sections: expectations, program evaluation, quality of student experience, and suggested improvements.

The following are some tentative conclusions of our initial analysis :

i. The majority of respondents stated that they were satisfied with how well summer school met their expectations; so much so, that they indicated a desire to attend another summer school or similar short program in the future.

ii. Most respondents indicated that the choice of lecture topics allowed them to better understand the discipline presented. However, a considerable number of them expressed dissatisfaction with the lecture topics.

iii. A high percentage of respondents said that their overall learning experience in the summer school was highly satisfactory.

iv. The evaluation given by respondents on sleeping accommodations, the quality of classroom and other facilities, and the overall organization of the summer school was favorable, apart from some negative comments regarding classroom facilities.

v. A significantly large number of respondents indicated a positive response to the content of lectures and expressed a desire to join another

short-term program, if one is offered in the future. A few respondents suggested that more time should be allowed for them to meet and talk with other participants.

vi. The things that most respondents liked: lecture contents, the laboratory visit, the field trip, and meeting other participants. However, some expressed dislikes, too: lack of communication among participating students, too many lectures, poor quality of course content, and lack of internet facilities.

vii. A majority of respondents agreed that handouts are useful for understanding the subjects and topics presented.

viii. Specific areas that could be improved are:

- More practical experience,
- More laboratory visits and field trips,
- Social, interactive events,
- Better housing facilities,
- Better internet access, especially wireless access points,
- A reduction in the number of lectures.