Interdisciplinary Area of Research Offers Tool of Cross-Cultural Understanding: Cross-Cultural Student Seminar for Communication Training on Biomedical Engineering

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ABSTRACT

Misunderstanding often occurs in a multidisciplinary field of study, because each field has its own background of thinking. Communication training is important for students, who have a potential to develop the multidisciplinary field of study. Because each nation has its own cultural background, communication in an international seminar is not easy, either. A cross-cultural student seminar has been designed for communication training in the multidisciplinary field of study. Students from a variety of back grounds have joined in the seminar. Both equations and figures are effective tools for communication in the field of science. The seminar works well for communication training in the multidisciplinary field of study of biomedical engineering. An interdisciplinary area of research offers the tool of cross-cultural understanding. The present study refers to author's several experiences: the student internship abroad, the cross-cultural student camp, multi PhD theses, various affiliations, and the creation of the interdisciplinary department.

Keywords: Multidisciplinary Field, Biomedical Engineering, Cross-Cultural Understanding, Student Seminar and Communication Training.

1. INTRODUCTION

A common base is necessary for communication. Similar experiences develop the common base. When common rules are defined, the communication becomes easier. That is the reason why you learn language, mathematics, SI unit, etc.

The biomedical engineering field is interdisciplinary [1-8]. In the field, communication is important between engineering and medicine. Both experimental procedures and technical terms are different between these fields. Both figures and formula, on the other hand, are convenient tools for communication in the interdisciplinary fields.

In an international project, you may experience misunderstandings, which depend not only on the language, but also on the cultural background. In a research project in the interdisciplinary field, you also experience misunderstandings, which depend on the methodological backgrounds. In this point of view, both international projects and interdisciplinary projects have the common problem. The problem supplies a good chance for communication training.

Explanation of a project on biomedical engineering is not so difficult, while biomedical engineering is interdisciplinary. Every project in biomedical engineering relates to a human being, so that everyone can image the contents related to oneself.

In the present study, a cross-cultural student seminar has been designed for communication training in the multidisciplinary field of study.

2. METHODS

Presentation training in international student seminar on biomedical engineering

1) Each student makes a presentation on his research plan related to biomedical engineering. The slides are available for the presentation.
2) Foreign students of a different special field of study review the presentation, whether it is easy to understand or not.
3) After the exercise in the seminar room, students visit some cultural sites, and introduce their culture to the foreign students.

Department visit

1) Students join in the international student seminar entitled "Introduction to biomedical engineering".
2) Students join in the seminar entitled "How do you create interdisciplinary field between engineering and biology".
3) Students visit the experimental project for students in biomedical engineering.
4) Students visit the laboratories of biomedical engineering.

Exercise: "Find a project to be solved in biomedical engineering field"

1) Each student finds an interdisciplinary topic, in which biomedical engineer may be interested.
2) Each student makes a presentation on the topic for a competition.

3) After the competition, everybody votes a topic for discussion.
4) Students make a group, and discuss about the topic.

3. RESULTS

Presentation training in international student seminar on biomedical engineering

The seminar was held six times from 2002 to 2010: five times in Japan (Fig. 1) and one time in Thailand. Approximately fifteen students from Thailand and ten students from Japan joined in each seminar. It was the first experience for Japanese students to make a presentation in English. The evaluation to their presentation was not very good, but the presentation of every Japanese student was understandable to Thai students. The figures in the slides might help for Thai students to understand the outline. Every topic is related to a human being, so that it is easy for the audience to get images of the contents. The presentation is good training for the students to explain contents in the logical order.

The presentation also gave a Japanese student a good opportunity to express himself to the person of the first meeting. After the seminar, communication among students continues to the sightseeing in the traditional places (Figs. 2 & 3). Some students keep in touch with the participants by e-mail.

Department visit

The group of students visited some departments of biomedical engineering abroad four times since 2005: USA and Thailand. It was not easy for Japanese students to understand the lecture in English (Figs. 4 & 5).

An experimental project for students in biomedical engineering was introduced to Japanese students. The topic was "Transportation through membrane", which is clinically applied to the dialyzer (Fig. 6). The topic was familiar to Japanese students, because they knew the medical instruments. The laboratories were interesting for the students (Fig. 7). Students exchanged ideas about the experimental system.

Fig. 1: Presentation training in international student seminar.

Fig. 2: Sightseeing in Kyoto in Japan.

Fig. 3: Sightseeing in Bangkok in Thailand.

Fig. 4: International student seminar on "Introduction to biomedical engineering".

Fig. 5: Seminar on "How do you create interdisciplinary field between engineering and biology".

Fig. 6: Experimental project for students of biomedical engineering.

Fig. 7a: Laboratory visit of biomedical engineering.

Fig. 7b: Laboratory visit: surgical robot.

Fig. 8a: Group discussion: "Find a project to be solved in biomedical engineering field".

Exercise: "Find a project to be solved in biomedical engineering field"

The student seminars were held in 2011 and in 2012 [8] in Thailand (Fig. 8). Five Japanese students and seven Thai students joined in the seminar. The topic, which every student found, was as follows:

1) Freeze technique for erythrocyte bank.
2) Serum for boosting cell regeneration.
3) Simulator on human nerve system.
4) Intelligent walking stick for blind-deaf person (both sight and audio assists).
5) Telemedicine network for rural health care (counseling).
6) Controller for emotion of a subject with medicine.
7) Can we distinguish mechanical properties between cancer cells and normal cells?
8) Collaboration between engineering and medicine to make a rescue system for a severe accident.
9) Temperature regulator to control viscosity of blood.
10) Tissue engineering for reconstruction of cartilage.
11) Behavior of erythrocyte through the micro slit.
12) Application of micro machining to cell culture.

Fig. 8b: Exercise: “Find a project to be solved in biomedical engineering field”.

“Intelligent walking stick for blind-deaf person” was selected for discussion. Students found several different back-grounds between countries through the discussion: the traffic situation in the city, etc.

Discussion extends the topic of “Behavior of erythrocyte through the micro slit” to the topic of “System design of the artificial spleen”.

4. DISCUSSION

Recently, we have a lot of tools for communication. Although the e-mail system is very convenient for communication, communication on face to face has more information than digital signals: movement, atmosphere, and many expressions. Letters can reveal feeling by handwriting. A telephone can give a tone of the voice. A handshake tells temperature, and the force of the muscle. Paying attention to the background is important for communication training. You may be surprised if some language systems do not have a term, which means “Reflection”. The culture might be positive.

At the beginning, students tend to pay attention to the language itself. After the seminar, students found: "it is easy to find the rule, but difficult to understand the background".

“Biomedical Engineering” is a multidisciplinary field of study, which relates to engineering and medicine [2]. Fig. 9 shows analogy between an organism and a machine. The machine consists of several parts, and transduces energy to make a movement with inhalation and exhalation. An organism also consists of several parts, and transduces energy to make a movement with inhalation and exhalation. The organism has variation, and adapts to environment by learning, although the machine is designed to keep stability.

When I was a student, I experienced a technical internship in the institute of artificial heart in Free University Berlin (Fig. 10). The research project of the artificial heart had been supported by collaboration between engineering and medicine. The experience gave me international sense and interdisciplinary sense, simultaneously.

I myself joined the cross cultural student camp every year, since I was nineteen years old. I experienced a lot of difficulties to communicate with students of different field of study, and of different background of culture.

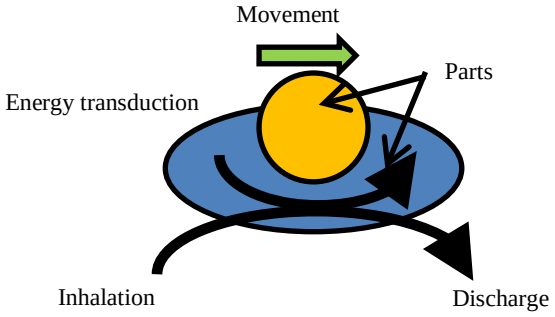

Fig. 9a: Organism.

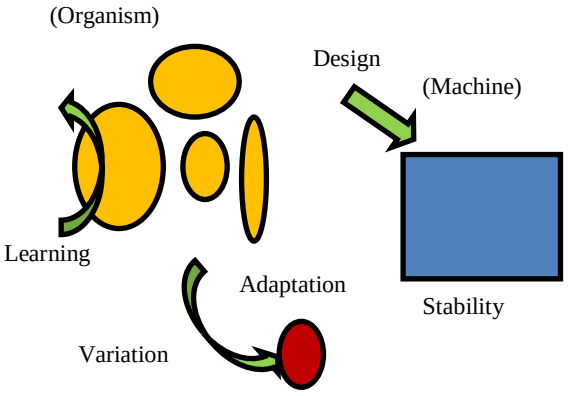

Fig. 9b: Organism and machine.

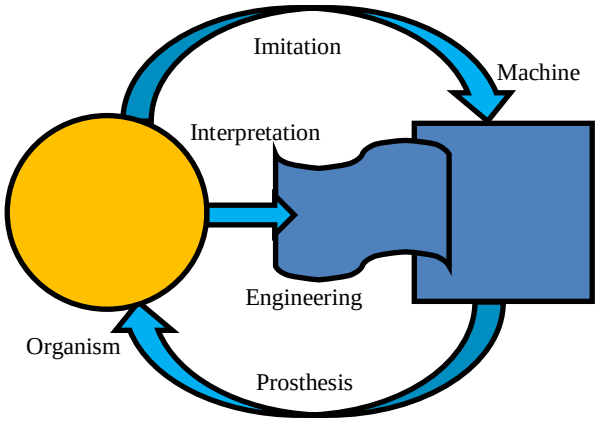

Fig. 9c: Engineering and organism.

I found different disciplines, when I take examinations for multiple PhD theses: one for medicine and the other for engineering. The research in the field of biology is based on individuality and time dependent, so that statistical processing is indispensable. The research in the field of engineering is based on homogenization, so that the experimental condition should be controlled. The referee of medicine requested number of experiment with keeping the protocol, although the referee of engineering requested the sophisticated condition of the experiment.

I also found different disciplines, when my affiliation changed: school of medicine, electronics, biomedical engineering and mechanical engineering. Each special field of study develops own discipline including the style of education. Each discipline has one's own technical terms. For example, "control" means "comparison" in medicine and "regulation" in engineering, respectively.

Creating the first department of "Biomedical Engineering (including bachelor, master, and PhD courses)" in Japan was a big challenge (Fig. 11). I created a new concept for the interdisciplinary department [1, 2].

1) Every professor has experienced interdisciplinary research.
2) Each course is charged by multi-faculties, and bridged to the next course [4, 5, 7].
3) Each lecture is related to the experimental project [3, 5].

Fig. 10a: Internship in institute of artificial heart in Free University Berlin, Germany.

Fig. 10b: Students joined internship in Berlin, Germany.

Fig. 11: The first department of Biomedical Engineering in Japan.

4) A small group of students rotates over the experimental projects of the special field of study, one by one [2].
5) The room for experimental project is facing to the room for research and to the office for professor [3].

The multidisciplinary field makes students learn several things: logical thinking, and flexibility without prejudice. The common background of "Biomedical Engineering" helps them find a way of thinking.

The shocking experience of the cross cultural seminar makes students notice "It is important to understand the background of thinking to learn the multidisciplinary field of study". Some of the students advanced the experience to the internship abroad.

5. CONCLUSION

A cross-cultural student seminar has been designed and applied to the biomedical engineering field. The seminar works for communication training in the multidisciplinary field of study of biomedical engineering. An interdisciplinary area of research offers the tool of cross-cultural understanding.

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