Pre-admission Education and First Year Education utilizing Information and Communication Technology at Universities

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Abstract: In this paper, we shall report on the pre-admission education and the first year education at Kogakuin University as the entire liberal arts education, including career education as well as mathematics education utilizing information and communication technology (ICT, for short), and also mention how to make the best use of these experiments in the future.

Keywords Information and communication technology (ICT), Pre-admission education, First year education, Higher education, E-learning, E-portfolio, Electronic “Karte”.

1. Introduction

In recent years, the difference of academic skills of newly enrolled students at private universities in Japan becomes bigger because of various university entrance examinations, for example AO (Admission Office) exam, recommendation exam, adoption of the National Center Test for University Admission, and so on. High-school students wishing to enter schools of science or engineering at universities have to study also the unit of differential and integral calculus for exponential and trigonometric functions originally. However, some students not learning that unit at high-school commonly enter these schools, and therefore those students cannot understand some fundamental techniques including solutions of ordinary differential equations taught at the general education course. To overcome these situations, universities enforce the pre-admission education before enrollment.

On the other hand, universities are devised as well as pre-admission, also the first year education after admission in many cases. In this paper, the pre-admission education and the first year education at Kogakuin University shall be introduced as the entire liberal arts education, including career education as well as mathematics education utilizing information and communication technology (ICT, for short). In addition, we describe the direction of the first year education in the future, including the use of ICT. This is a developed paper of the original papers [1] and [2].

2. Pre-admission Education

Currently, we issue a booklet for pre-freshmen so as to raise awareness of learning at Kogakuin and get to spend meaningful time to enrollment (see Figure 1).

Fig.1. Booklet for pre-freshmen
When the author was a lecturer at the Academic Support Center, Kogakuin University in the AY (Academic Year) 2006, it was conducted as pre-admission education first, and he was in charge of the math class. The Academic Support Center of Kogakuin University established in May 2005 is a department in order to create an environment to follow the basic academic skills necessary to understand the lectures at the university. For more information, see the activity reports of the center in Japanese listed in the references [3]-[5].

In the AY 2006, we had fundamental lectures in four subjects, mathematics, physics, chemistry and English by schooling style, that is, the style to give lectures such as in a classroom at university, for four days targeting the students for entering Kogakuin University by recommendation from the affiliated senior high-school. As to the math lectures, we taught some fundamental but significant sections in analysis learned at high school before, for example exponential, logarithmic and trigonometric functions.

Next year, we spread the target to students from not only the attached high-school but also other general high schools by recommendation. The major difference with the previous year is the class configuration. In the previous year, we made classes separated by mathematical ability. However, in the AY 2007, we divided the class for each department which the students would enter.

For four years from the AY 2008 through 2011, the author does not know well in details because he had moved to Waseda University in April 2008. After coming back to Kogakuin University in the AY 2012, he was in charge of pre-admission education again. In this education, we change the style of schooling days. The students have to join the guidance on each department as well as lectures in one day each in December and February. They also have to take home assignments on mathematics and English in this interval and take mini examination on mathematics to ensure proficiency. In the schooling in February, we give a lecture in science to be applied in universities and society. It expects to increase the motivation to study at university. As a result, the average score increases about 5 points than the previous year, and the students did not feel the decline in academic ability so much.

In the AY 2013, we prepare the same content for pre-freshmen. The author gives a lecture for high-school students passed to enter the department of computer sciences. In this lecture, he teaches binary numbers and their calculus using Napier’s binary chessboard as an introduction of a system of numerical notation (see Figures 2-3). For more precise reports on pre-admission education, see the references [6]-[9].
3. First Year Education

Most first year students have to study calculus and linear algebra, and some students study differential equations, geometry, algebra, vector analysis, complex analysis and information mathematics. Here, we describe the features of calculus which is the most familiar with the first year mathematical education.

(1) Conduct the mathematics placement test for all freshmen immediately after admission, and it is strongly recommended to attend the basic course held by the academic support center for students scoring below a certain (see Figure 4).

(2) Students are prepared e-learning content for tutoring that can be self-study anytime and anywhere as students like (see Figure 5).

(3) At the academic support center, students can ask questions individually. The students can see their records as an e-portfolio. These records are registered by the teachers as an “e-Karte”, that is an electronic record card on the Learning Management System (LMS, for short) (see Figure 6).

Our students’ e-portfolio equipped not only an exchange of questions at the academic support center but also a grade transcript, attendance of all lectures, a record of job hunting and interview, and so on. Students have their own security code in order to log-in the e-portfolio, and can access their individual e-portfolio anytime and anywhere. Professors in charge of each lecture and seminar, and staff of university can also access students’ e-portfolio to input their data and check their record of learning situation under the law of the privacy protection.

We here mention the LMS at Kogakuin University in relation to these features above. Currently, self-study e-learning content of mathematics on our LMS, there are three types of “trigonometric functions”, “differential calculus” and “Maclaurin expansion theorem and L’Hospital’s theorem”. The second content was made by Professor Zen-ichi Yosimura and the author in the AY 2007.

Our LMS also has a system of e-portfolio which includes individual grades transcript and academic questions at the academic support center of the student. Therefore, we would like to make the most use of this. Moreover, we propose the use of smart devices for self-learning because most students have their own devices in recent years (see Figures 7-9).
Fig. 7. Self-learning by e-learning system of Kogakuin University using a laptop computer (above) with a smart device (iPad mini) (below).

Fig. 8. Window of the laptop computer in Fig. 7.

Fig. 9. Window of the smart device in Fig. 7.
4. Career Education for freshmen

Here, we introduce the fundamental seminars those are carried out in the first year at Kogakuin University as part of career education. The author was responsible for 10 students of the department of mechanical systems engineering from 2013. First, there is the orientation camp for two days just after the entrance. In this camp, there are two important things. One is an orientation to get used to university life, and the other one is a team building which is a group work to create an original car along with the given theme (see Figure 10). By applying the educational system like this immediately after admission, students can deepen the bonds of friendship and spend.

Fig.10. Group work in the camp

After the camp, a weekly seminar is performed. This seminar is helpful for campus life, job hunting and life as a member of society. We also prepare mini-experiments of micro-machining and robot production in order to enhance motivation of students. For more precise reports on the first year education, see the references [10]-[12].

5. In the future

As described above, we have implemented our pre-admission education and the first year education, including career education as well as mathematics education at Kogakuin University. However, there is still room for improvement. For example, by more effectively utilizing the e-learning system in the pre-admission education, we can provide education tailored to the level of each student as well as managing students’ data as e-portfolio. The author is in charge of mathematics but, in the light of the above points, we would like to reconsider a wide range of the first year education. At Kogakuin University, there is a good e-learning system and the author has a lot of magnificent experiences utilizing ICT. Therefore, he has to revise and create more e-learning content including career education for students in order to raise the standard of students’ basic skills, and improve the environment through the LMS for students, faculty and staff. Moreover, the electronic portfolio and learning material utilizing ICT are applied to several academic fields including medicine, because of the useful to access anytime and anywhere with secure code.

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References


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