Effects of Organized Team-Activities for Engineering Foundations Education

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Abstract

Kanazawa Institute of Technology (KIT) established the Mathematics and Science Education Center (MSEC) to improve education quality of the engineering foundations education (mathematics, physics and chemistry). The MSEC is responsible for the engineering foundations education and is carrying out class room lectures together with their learning support on the basis of organized team-activities.

We presented various team –activities in the MSEC performed by the Mathematics and Science Education Study Meeting (MSESM), which is a core engine of the team activity in the MSEC, at ICEE 2008 in Hungary [1]. The activities performed by the MSESM are regarded as Faculty Development of the engineering foundations education.

Following to the last presentation, we herein present the effects of the above team- activities. We continuously carried out a questionnaire survey of our engineering foundations education from viewpoints of learning motivation, self-learning behavior, stimulation of learning interest, improvement of academic ability and the degree of class satisfaction for all freshmen from 2005 to 2008. As a result of the survey, remarkable improvement can be seen in the above viewpoints so far.

1 Introduction

Recently, the ratio of students who go on to the higher education to high school graduate exceeds 50% in Japan. Then, all students enable to enter the school if they agree to enter any kind of the school. Accordingly, the fundamental academic ability of the college freshmen is lowering in general. Furthermore, their wishes to learn are also weakened.

In order to cope with lowering of the academic ability and learning will of students and to improve the education quality of engineering foundations education (mathematics, physics and chemistry), Kanazawa Institute of Technology (KIT) established the Engineering Foundations Education Center (EFEC) in 2000°°currently its name is the Mathematics and Science Education Center (MSCE) °Ω[2].Since then, we started the integrated Mathematics and Science with engineering education (IMSE) as a core curriculum of the engineering foundation education in KIT.

This curriculum aims to recognize students a practical application of mathematics and science to engineering and to deepen interest, concern and understanding of mathematics and science. This also aims to stimulate learning motivation and learning will for engineering of our students. The basic idea of the IMSE is “the mathematics is tool for engineering” and then classical approach of mathematics is suppressed in minimum.

The MSCE has been carrying out the above IMSE by the organized team-activities in addition to the personal effort. There are following two kinds of team-activities,i.e.,

(1) MSESM

As an engine of the organized team-activities, we organized the Mathematics and Science Education Study Meeting (MSESM) that pursues adequate teaching and learning methods in the engineering foundations education. This MSESM is a kind of Faculty Development for the engineering foundations education. We presented several examples of the MSESM activity in the last ICEE 2008 in Hungary[1].

(2) VLSP

In addition to the above MSESM activity, MSEC has been also carrying out various learning support programs (VLSP), which are composed of individual tutoring, additional test program to regular examination, supplementary lecture to the IMSE class and e-learning program for promoting student’s self-learning skill.

Based on the above two kinds of organized team-activities (MSESM and VLSP), we are going to proceed the engineering foundation education. Here we present the effects of our organized team-activities for the IMSE education from 2005 to 2008. The effects are evaluated by the questionnaire survey for all freshmen in each year.

2 A questionnaire survey of the effects of IMSE for freshmen

2.1 Background of the survey

We have been carrying out the IMSE from 2000 and investigating the effects of the IMSE class at every year-end for all freshmen. The total number of the freshmen is approximately 1700. Same questionnaire survey is kept from 2005. The questionnaires were filled out anonymously.

2.2 Detail of survey in 2008

The questions concerned with the effects of IMSE are:

[Q1] Did you study IMSE with high motivation?

[Q2°] Did you get into the habit of self-learning?

[Q3°] Did IMSE stimulate your interest in studying Math?

[Q4°] Did IMSE improve your academic ability of Mathematical approach?

The results are shown in Figures 1, 2, 3 and 4, respectively.

Figure 1 Did you study IMSE with high motivation?

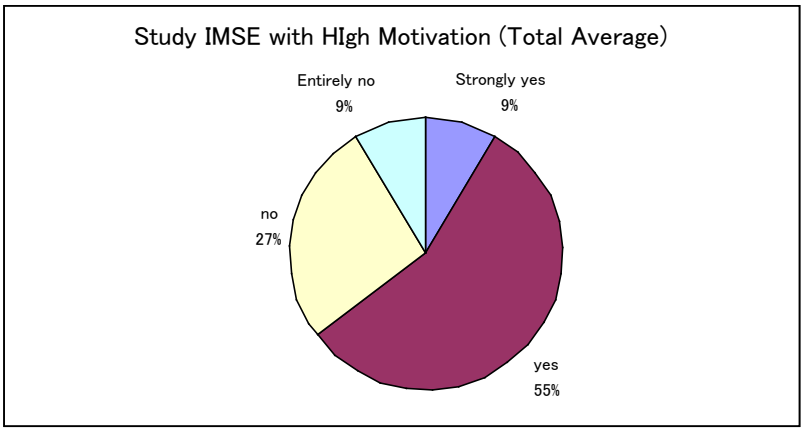


Figure 2 Did you get into the habit of self-learning?

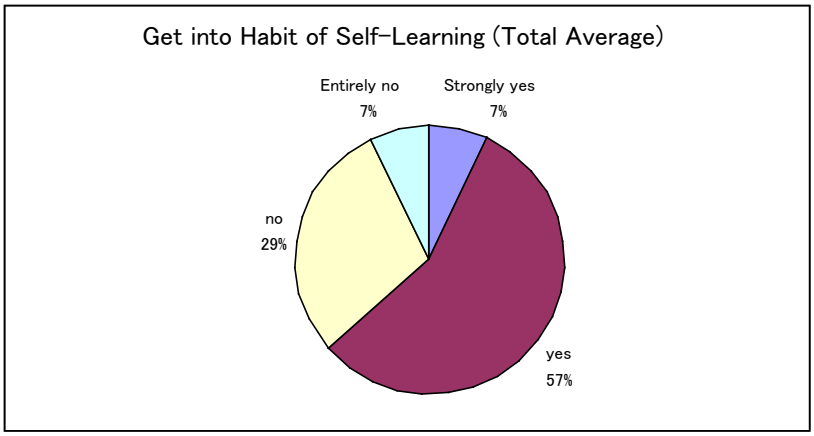


Figure 3 Did IMSE stimulate your interest in studying Math?

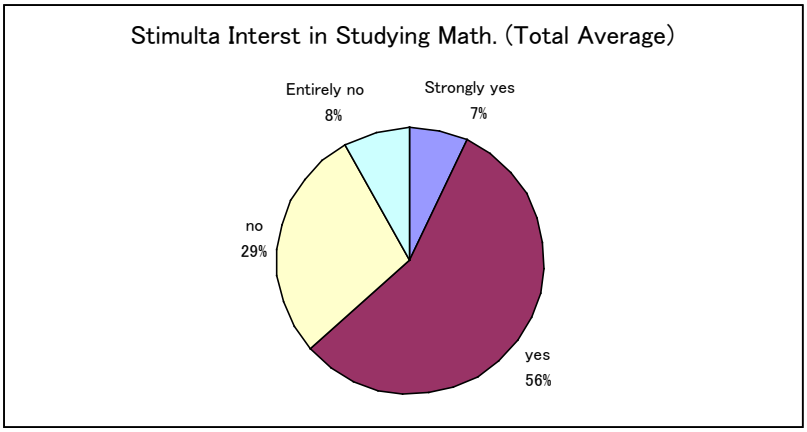
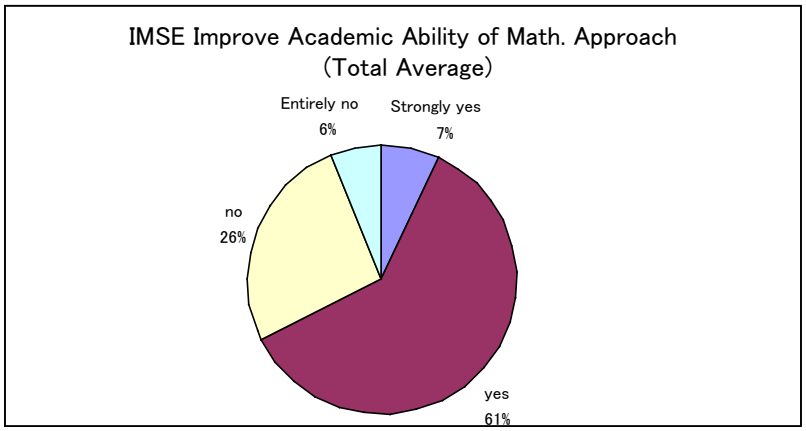


Figure 4 Did IMSE improve your academic ability of Mathematical approach?

_From those figures, it is shown that almost 70% students of total freshmen study IMSE with high motivation, get



into habit of self-learning, stimulate their interest in studying Math and improve their academic ability.

2.3 IMSE Effects Change from 2005 to 2008

Same questionnaire survey carried out from 2005 to 2008. The results are shown in Figure 5, 6, 7 and 8, where Q1, Q2, Q3 and Q4 in 2.2 are corresponded, respectively.

Figure 5 Did you study IMSE with high motivation?(From 2005 to 2008)

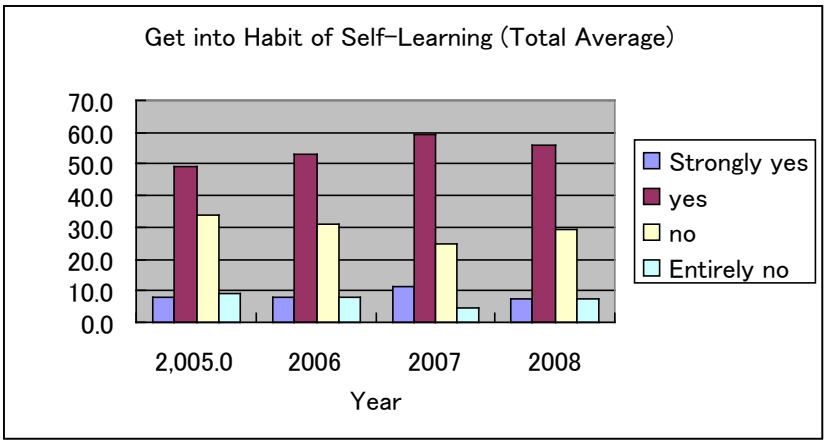


Figure 6 Did you get into the habit of self-learning? (From 2005 to 2008)

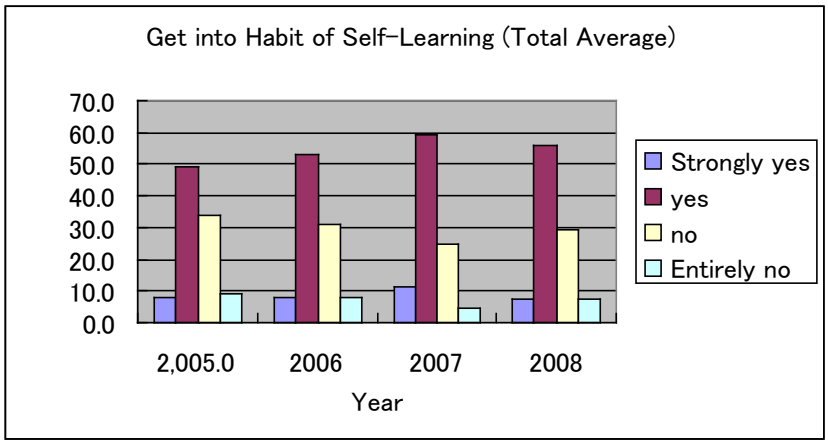


Figure 7 Did IMSE stimulate your interest in studying Math? (From 2005 to 2008)

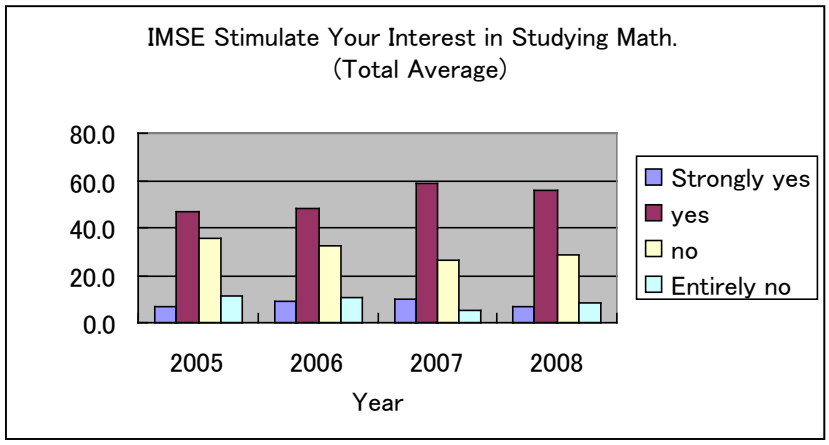
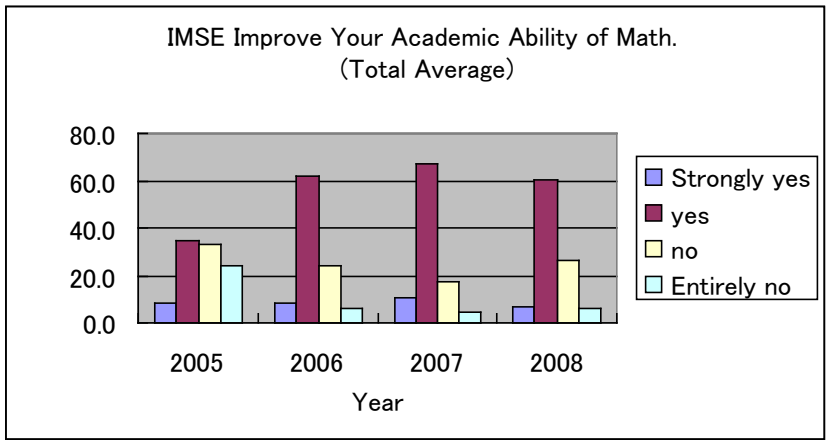


Figure 8 Did IMSE improve your academic ability of Mathematical approach? (From 2005 to 2008)



From those figures, it is shown that the effects of IMSE for student's learning motivation, student's habit of self-learning, stimulation of studying Math and improvement of student's academic ability positively increase year by year.

3 MSEC Various Learning Support Programs for freshmen

MSEC has been also carrying out various learning support programs (VLSP) from 2000. These programs are mainly

divided into three categories, i.e., the individual tutoring, the additional test program to normal examination and the supplementary lecture to IMSE class.

Figure 9 shows the total numbers of MSEC user from 2000 to 2008. As can be seen from this figure, approximately 14000 persons (total number of students) utilized MSEC except 2000.

The percentage of user's class from 1st to 4th is shown in Figure 10.The 1st class user predominantly occupies about 70% in total.

In addition, the utilization ratio corresponding to each learning support program is shown in Figure 11. The individual tutoring and the additional test program to regular examination are remarkably utilized.

Figure 9 Total Number of MSEC User (From 2000 to 2008).

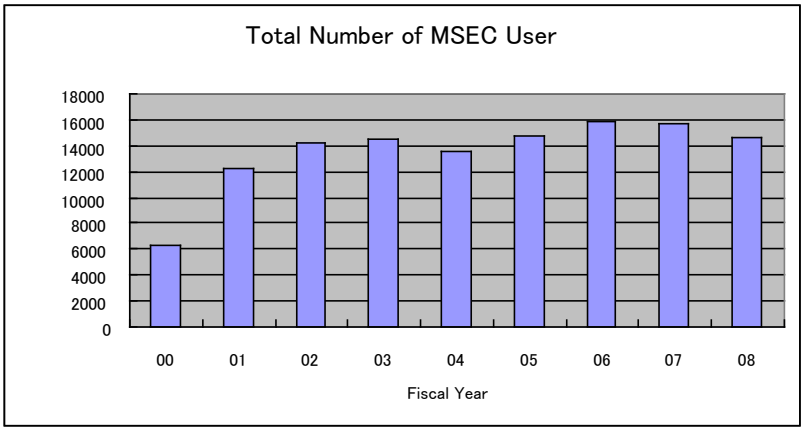
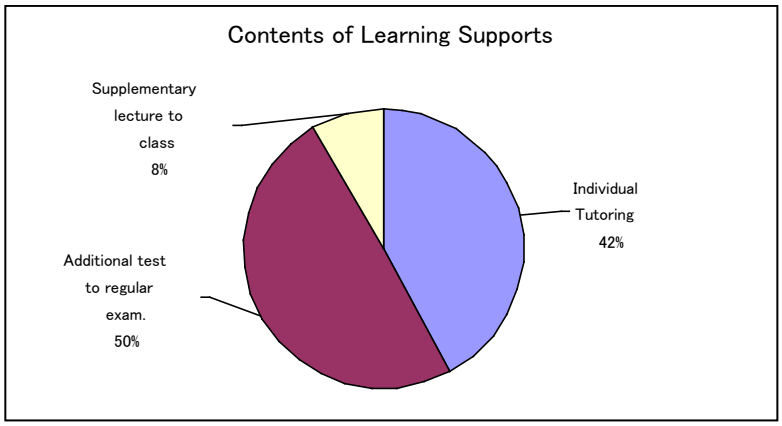


Figure 11 Utilization Ratio of each Learning Support Program (2008).



We interviewed the reasons of utilization of MSEC for freshmen in 2008. The results summarized in Table 1, where the percentage means the ratio of respondents to total number of MSEC users. The top reason is "students enable to ask any question at any time".

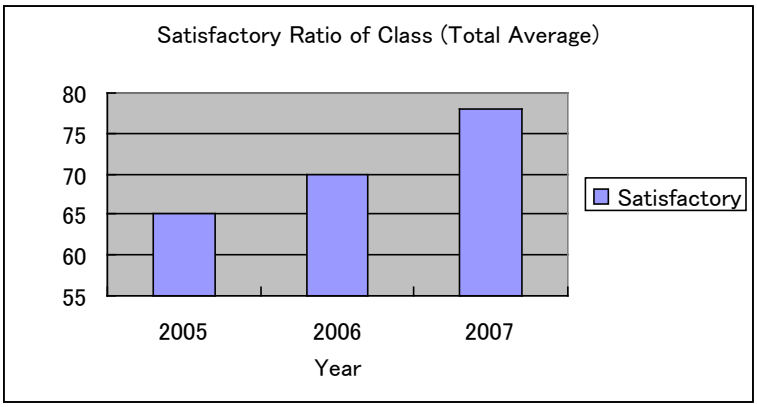
Table 1 Reasons of utilizing MSEC

Enable to ask any question at anytime	43% (of total user)
Good Man-to-man tutoring with teacher	31%
Tutor teaches politely and kindly	31%
Homework can be supported	29%
Consultatation without hesitation	26%
Tutor eagerly teach	24%

4 Survey of IMSE Class Satisfaction

_We also continue to investigate IMSE class satisfaction from 2005. Figure 12 shows the satisfactory ratio (i.e., ratio of students who satisfy IMSE class to all freshmen) from 2005 to 2008. As can be seen from this figure, the satisfactory ratio of the IMSE class is gradually increasing from 65% to 78%, respectively. We understand that this large improvement was achieved by our organized team-activities of MSESM and VLSP. The data of 2008 is under estimation at this moment.

Figure 12 Satisfactory Ratio of IMSE Class (From 2005 to 2007).



5 Conclusions

We have been carrying out two kinds of organized team-activities of MSESM and VLSP from 2000.We found that those two kinds of organized team-activities gradually cause good effects of IMSE for the engineering foundation education.

From 2008, a new curriculum and course content of the engineering foundation education started, where we adopted individual IMSE which is taking account of characteristics of each college shown in the Appendix. The result of this new IMSE class satisfaction is now under estimation. We are looking forward to achieve good number in the degree of IMSE class satisfaction.

We believe the organized team activities of MSESM and VLSP are key activities of our FD to improve our engineering foundation education.

References

01. K.Aoki, et. al.,(2008), Development of Organized Team-Activity for Engineering Foundations Education, ICEE 2008 Abstract book, TOPICS No.6, 77.

02. M.Mizusawa and Y.Murai(2001), Educational support system of engineering foundations education center., KIT Progress, No.7,pp.7-12 (in Japanese).

APPENDIX Organization of Kanazawa Institute of Technology (Under graduate)

1 Academic Foundations Programs
2 College of Engineering
Division of Mechanical Engineering
Department of Mechanical Engineering
Department of Robotics
Department of Aeronautics
Division of Electrical Engineering
Department of Electrical and Electronic Engineering
Department of Information and Communication Engineering
3 College of Environmental Engineering and Architecture
Division of Environmental Engineering

Department of Civil and Environmental Engineering
Division of Architecture
Department of Architecture
Department of Environmental and Urban Design
4 College of Information Science and Human Communication
Division of Informatics and Human Communication
Department of Media Informatics
Department of Psychological Informatics
Department of Management Systems
Division of Information and Computer Science
Department of Information and Computer Science
5 College of Bioscience and Chemistry
Division of Bioscience and Chemistry
Department of Applied Bioscience
Department of Applied Chemistry