

Roots Finding – PBL in the First Year Course –

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Abstract

Design subjects have become popular in the engineering education. In these subjects, an active learning skill was introduced to students. Students have to decide a theme and the way how to study it and to find answers by themselves. This learning method was developed in the early year courses in the University of Tokushima. The common learning curriculum among whole university adopted this design subjects from 2005 of the school year and eleven more new subjects started. “Roots finding” is one of them and the objectives are to gain abilities of self-study through the research on a particular subject, and make report then presenting them. Self-learning ability, research ability and presentation skills were enhanced through this subject.

Keywords: Active learning, Self study, Research, Report, Presentation

I . Introduction

Since 2000, “Design Subjects” have been developed in Faculty of Engineering, Tokushima University. The objectives of the Design Subjects are to improve an ability of active learning and self-learning as well as a presentation and a communication skill, and so on. Further, we developed a learning system of “Design Subject” into the freshman course in the Liberal Arts in the year 2005. The keywords of this new type of subject are (1) to act by oneself, (2) to study based on experience, (3) to study out of campus or classroom, (4) to act within a small size group, (5) to have a frequent discussion in a group and (6) to make a presentation and presentation evaluation. Important point in the early period in the university learning is to construct an independent learning method and to make a basement of self-learning for a continuing four-year school term.

II . The Class “Roots Finding”

In this class, through investigation of the roots of some innovation, we want to give the students a motivation for creativity and learn a method of creation and let them recognize that the creation will not be arisen from a simple thinking. On the other hand, important points on the research or investigation are to notice the following matters: (1) What is the background for newly developed matter? (2) What are necessary things to develop them? (3) What process was taken by the developers in a historical flow?

Furthermore, we must educate students to be able to work in the international field. In order to do this, it is important for the students to have their own idea, not the idea which is taught by other person, to have an ability of presenting his/her idea, and to have an ability to communicate with other engineer. In order to achieve these things, the students must perform self-learning and giving off more presentation and the teachers must prepare a field or a space for the students to perform.

As a traditional type of university learning, we took the following system: A class constitutes a large number of students and they work individually and

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<Table 1> Time table for “roots finding”

Class	Subject	Remarks
1+2	Introduction of presentation (present oneself)	How to introduce oneself
3	Learn the way of “Roots Finding”	Brain storming method, KJ method, presentation method, the method of presentation evaluation, etc.
4	Search and determination of the subject	
5+6+7	Investigation and report (1)	
8+9+10	Investigation and report (2)	
11	How to make a final report	5W1H
12+13	Final presentation and presentation evaluation	Presentation evaluation
14+15	Bookbinding	

passively in the class. The class takes one-way teaching system, i.e., the information streams in one-way direction from the teacher to students. On the other hand, the new class takes the following system: The class is constructed by small number of students and they work actively within a group. The information streams from students to all of the participants. Therefore, the new system does not require the teacher to teach during the class, however, the students themselves manage and control the classroom and have discussion with each other to attain a goal. Almost everything in the class is conducted by the students. The contribution of the teacher is only to control the process of the class and to propose thinking devices useful for working.

As shown in <Table 1>, fifteen weeks of “Roots Finding” are scheduled. Beginning with introduction of presentation, they learn the way of “Roots Finding”, and so on. The first work in this class is to introduce oneself, that is, to describe their own roots.

Here are the examples of self Introduction during the current class. On the first day of the seminar on Technical Engineering English, 6 third year students from the Department of Mechanical Engineering were asked to introduce their self to the class. The first student, Mr. A, introduced himself as follows: “I belong in the third year course of Department of Mechanical Engineering. My name is…….” The part “……” is his name but everyone could not catch his name because he speak in lower voice. All the students followed him by making the same mistake during their introduction. These mistakes are unacceptable because the information do not reach to

other people. It is unacceptable because these mistakes happened to the third year students of Department of Mechanical Engineering. There is no meaning to do the self-introduction because listeners cannot even hear the name of the speaker.

Important points of self-introducing are to introduce his/her roots, personality, skills and so on, and they must think about how to appeal themselves to others. Firstly, the students discuss with each other and then decide the items for introducing oneself. In one class, they summarized the items of introducing oneself as follows:

- (1) Name and age
- (2) Faculty, Department, School year (His/her affiliation in the university)
- (3) Place of birth (Where did he/she come from?)
- (4) Things that interest them and hobby
- (5) The reason why he/she entered this university
- (6) Club activity
- (7) Personality and specialty
- (8) Future planning (What will he/she do in the future?)
- (9) Expectation to this class

After speaking on these items, it seems that they became friendly as if they had already met each other many times.

In the 3rd and 4th classes, we learn a method of “Roots Finding” including the way of collecting information, brain storming method, presentation method and method of presentation evaluation. Then, the students propose and decide the subject which he/she wants to study (see <Table 2>). Also, they need to describe the reason why he/she decided to study it. After the classes about basic methods which are used

<Table 2> List of the theme decided by each student in “Roots Finding”

Theme	Affiliation of the student	Grade of the student
Constitution of Japan	Faculty of Integrated Arts & Science	Freshman
Roots of pharmacist	Faculty of Pharmaceutical Sciences	Freshman
Roots of engine	Department of Mechanical Engineering	Sophomore
Roots of airplane	Department of Mechanical Engineering	Sophomore
Roots of space ship	Department of Mechanical Engineering	Sophomore
Roots of robot	Department of Mechanical Engineering	Sophomore
Roots of memory media	Department of Mechanical Engineering	Sophomore
Roots of game machine	Department of Information Science	Freshman
Roots of energy	Department of Biological Science	Freshman

in performing the class of “Roots Finding”, the students will study or investigate the origin of the matter: What is the background? When and by whom was the matter created? And then, how did it develop in the history and how will it develop in the future?

In the 5th to 10th classes, each student researches and investigates the roots and the history about his/her subjects and presents them to the other students who stand as audiences. The audience comments upon the materials which the presenter has reported. The presenter takes back the comments and look for the answer for the question. This answer will be presented in the next class. The questions and answers are repeated several times to improve the materials.

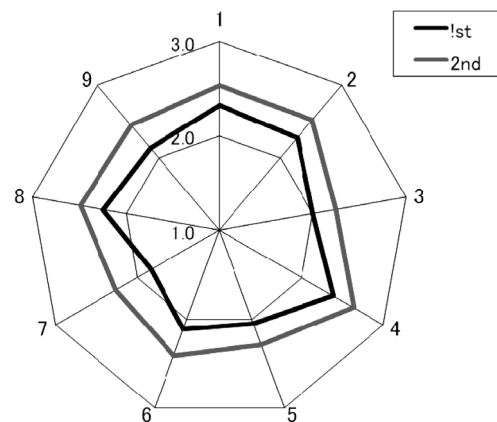
Final presentations and the presentation evaluation are made in the 12th and 13th class. Items of presentation evaluation are made of two parts, i. e., skills to present and contents of presentation. Items of this evaluation are also considered and decided by students themselves. The followings are the evaluation items decided by students.

Way of speaking:

- (1) Power of voices, stress and rhythm of the speech
- (2) Speed of speaking
- (3) Eye contact
- (4) Clear explanation of the document
- (5) Pause in the speech
- (6) Standing posture
- (7) Time allocation

Contents:

- (8) Understandable documents
- (9) Logical structure (abstract, main body, results)



[Fig. 1] Presentation evaluation made at the intermediate presentation and the final presentation.

According to these items, the presentation evaluation was made in the intermediate presentation and the final presentation. [Fig. 1] shows that repeated presentation enhances all the items of the presentation skill as well as the contents.

Final goal is to make a booklet of their studies. Before the bookmaking, we learn how to make a report. The concept of “5W1H”, i. e., “when, who, what, where and how”, is very useful to summarize the contents. By using a document in newspapers, we learn how the “5W1H” is composed in the newspaper.

The final part of this class is bookbinding. The students plan a book design, such as cover and title of the booklet, the person who writes preface, the page about the body of contents, research results and postscript. After that, all members reviewed the other person’s manuscripts and check and comment them. The work of printing and bookbinding were followed and then the subject “Roots Finding” was finished.

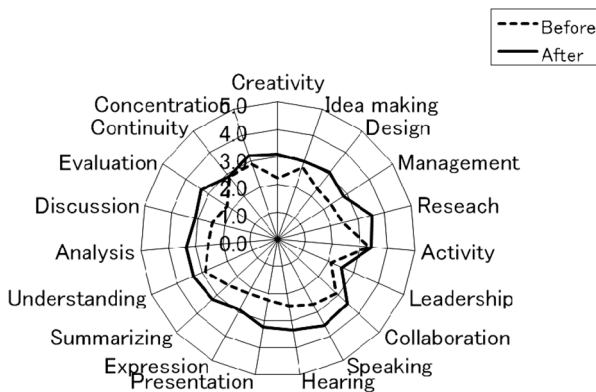
<Table 3> Final stage of the class

1. Book design
(1) Cover and title
(2) Preface
(3) Table of contents
(4) Research result (Theme 1)
(Theme 2)
....
(5) Postscript
2. Review of the manuscripts
3. Printing
4. Bookbinding

Accomplishment of the booklet is one of the final evaluations of the “Roots Finding”. They experience the way of self-learning and share the skill of communication among classmates.

III. Abilities Which the Students Obtained from the Class “Roots Finding”

Another questionnaire was taken on 19 items of abilities before and after the class “Roots Finding”. [Fig. 2] shows the enhancement of the abilities evaluated by the students themselves. Through this class, the students experienced an independent activity. Almost of all the works in the class were made by the students through communicating with each other. The experience enhanced many skills as summarized in [Fig. 2].



[Fig. 2] Before and after evaluation of the ability in 19 items.

IV. Summary

Characteristic of “Roots Finding” is as follows:

- (1) Introduced as a new learning method based on research by the students themselves.
- (2) The class prepares a chance of frequent discussion and presentation.
- (3) Students construct and manage the class as possible as they can on their own.
- (4) The students work actively by themselves in the class.

The learning system “for the students and by the students” is achieved in the “Roots Finding” class. If the students feel a fulfillment in this class, their carrier-up mind would be promoted.

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