PBL Supporting System
Based on the Range of Teacher's Guidance

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Abstract-**PBL (project-based learning) have proven to be effective in improving problem-solving abilities. This learning method is highly dependent on the expertise and experience of the professor, resulting in a broadening of the content and methods of PBL. This broadening has generated a difference in what a PBL student learns and how well they learn it. This research develops a support system for PBL and aims to solve some of the problems of PBL.**

Keywords-components; Problem Based Learning; Deciding Title; Database

I. Introduction

Some have begun to feel that university education has become unsatisfactory in Japan because the content of what students learn at a university does not correspond to the requirements of society. For instance, the ability to request from the student is a problem solving skill in the enterprise that develops the information processing system in a certain investigation from the skill of the computer technology from which communications skills etc. are contained.

Problem based learning (PBL) is a learning method that was developed to improve problem solving skills (Doppelt, 2003). It has since been widely introduced into other fields such as business administration, sociology, etc. At the university in Japan, PBL has been introduced into the curriculum, but it is generally limited to the fields of medicine, nursing science, and engineering. There are many reasons that it is not implemented in more fields. One such reason is because teachers who implement PBL have an increased workload because PBL requires students to be more aggressive in their approach to problem solving; thus, teachers must stimulate such aggressiveness in their students. Due to the relative dearth of PBL in universities, we have developed a system that may provide a solution. This was achieved by using this system to address the issue. The results of this process allowed us to introduce standardized content that should assist teachers who wish to implement PBL.

II. PBL

A. About PBL

Ikeda[2] defined PBL as 'an educational technique by the few people group practiced by the learner while accompanying the work of reflected repetition.' PBL is the acronym of problem based learning. PBL is often adopted in curricula associated with medicine, odontology, nursing science, environmental science, law, and engineering. In PBL, first, a teacher introduces a problem to their students. Next, the teacher has the students determine a method that can be used as a solution. Finally, the teacher has the students execute the solution and evaluate the results.

B. The Process of PBL

We have been doing PBL for one year now. In Japan, PBL is implemented one year before a student graduates and is called 'graduation research'. Students perform research activities over the course of the year and present the results of their research at the end of the period. The results of the students' research are evaluated, and students can graduate if they receive a good evaluation. In this paper, we describe our research of the system that supports 'graduation research'. The process of graduation research is roughly as follows.

1) Deciding the title of the research: The teacher and the student discuss the content of the research.

2) Making the research plan: First, it is necessary to examine the research plan before research activities are started. The result of the examination is filled in by the format 'research plan document'.

3) Execution of research activities: The experiment, investigation, and production advance according to the approved research plan document. The outcomes of the research are kept in a portfolio.

4) Evaluation and conclusion that analyzes the research result: When the research is completed, the outcome of an experiment and the results of the survey obtained by the research work are analyzed and evaluated. Those results are given official approval if they are acceptable to the teacher.

5) Presentation of the results: Finally, students present their results orally and submit a paper on their research.

C. The Problems of PBL

The following problems exist if PBL is limited to 'graduation research'.

1) The content of a teacher's guidance varies according to their specialized field and experience. Teachers' specialized fields differ in an integrated faculty that consists of various specialized fields. Furthermore, teachers' instructional methods also differ.

2) Students begin their graduation research during job hunting season in Japan. Therefore, students may not be able to concentrate on their graduation research in the most effective manner.

3) Students often delay the research planning process because they have no knowledge of planning or management methods for graduation research projects.

In particular, low-quality work during the research plan process often causes a delay in beginning the research and requires many corrections to set students on the right path.

III. The Support System for PBL

Polite support for the students is especially necessary in the first stage of PBL. Then, the content of the learning support that the teacher and the tutor provide is stored in the knowledge base of the system. Furthermore, a mechanism that students can use to answer questions using the system is necessary. The process should be similar to that of a teacher asking a question of a student.

A. The Outline of the Support System for PBL

We developed a system that supports the student in the first process of PBL (deciding a title and creating a research plan document), and have tried the introduction. An explanation of the system is as follows. This system is composed of two modules, which support the 'decision of the title of the research' and 'creation of the research plan' steps, respectively.
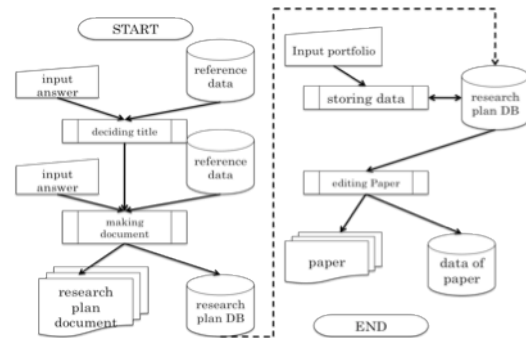

Figure 1. The outline of the support system

In the module that supports 'decision of the title of the research', it becomes a mechanism to which the original bill of the title is automatically displayed by questioning on the term that composes the title of the system, and connecting the content that the student answered it. A database that includes the structure of the research plan is prepared beforehand. In the module that supports 'the creation of the research plan', the question is generated from the database in the student, and the student makes the content of the data base buried by answering the question. When the content of the database where this answer is buried is output, the draft of the plan is made. The plan without the omission fall of the item that composes the plan can be smoothly made by this method. Moreover, we think that this process also helps the student better understand the structure of the research plan document.

B. The Support Module for Deciding the Title of a Project

This support system decides the research title using a conversational method. First, we focus on the terms that make up the research title. These terms are assumed to be a parameter of the title sentence. Because the student inputs these parameters while talking with the system, the title can be made in this system. It is a method of the teacher and the student's proofreading the made title sentence, and completing the title. These following four parameters are used by the system.

1) The field in which the student is interested.
2) The more detailed field.
3) The standpoint of the research (example: Manager, Researcher, and User, etc.)
4) The viewpoint of the research (example: Cost, ethics, and custom, etc.)

In this module, a title is decided upon according to the following procedures. The student inputs an answer to the questions and selects the desired parameters. When the student answers all of the questions, the answers (the parameters) are connected and the system displays the combination, which may serve as a hint for creating a research title.

Table 1. The structure of Database

Interest Field	Detailed Field	Subject of Field	Action of Research
Web System	Mail Order	Sell downloads	Development
		Sales of Agricultural Products	Consideration
	e-Counseling	Health	
		Food Recipe	
	e-learning	Exercise	Comparing
		Programing	
Robot	Biped Robot	Soccer	Experimental
	Car Robot	Transportation by Automatic Operation	
e-society	SNS	Psychological Impact	Rsearch
		Regional cooperation	

These questions are content like Table 1. This table is composed of the specialized field of the teacher whom the teacher can guide. Next, the research paper database is referenced using the parameters input in the title decision process. Papers on topics that are similar to the students' chosen interests are retrieved from the database. About 13 million research papers are stored in this data base, which was established by the Japanese National Institute of Informatics. Finally, the student decides their title by proofreading incomplete sentences.

C. The Support Module for the Research Plan Document

This module supports the creation of a research plan that examines the purpose, meaning, method, and evaluation of the research according to the chosen title. The research plan provides a clear description of the background, purpose, procedure, and schedule of the research. In the current study, we developed this module to support the creation of a research plan document. Additionally, successful implementation of this module will standardize the graduation research.

Table 2. Question prompts used for the background section

Question group	Question	Intention of question
Societal trends	Please supply the societal trend that corresponds to your research.	To find the trends within society that relate to the research.
Student's Problem	What problem exists within social trend that you selected.	To ensure that the student can correctly identify a plausible research problem.
Student interest and motivation	Why are you concerned with this ptroblem?	To clearly identify the reasons why the student chose to address a ploblcm.
Rcsearch purpose	What will your research accomplish?	To cnsurc that the students is clear about the purpose of their research.

This module presents the previously stored question from the database in sentence form. The student inputs their answer to the question as in the 'Answer input' field. The 'Intention of the question' is displayed under the question sentence. The purpose of this display is to support the

student while they perform enter data into the 'Answer input' field. The system connects these answer sentences and outputs them as syntax and as a text file. These are both displayed on the screen. The student proofreads the sentence and the text file using the text editor. Next, the student submits the result to the teacher as a research plan document. Table 2 shows some example question groups and the corresponding breakdown of the questions.

The research plan is generated as a database, which is composed of chapters such as 'Background and purpose', 'Research method', 'Experiment and result of the survey', and 'Summary'.

IV. The Trial of the Support System for PBL

We tried the support module to decide the title. In the first process of PBL with this support system, ten students were chosen to participate. Next, we evaluated the effectiveness of the introduction of this system and searched for any operational issues. When we used former supporting system, we had spent on the process of deciding the title for about two months or more. However, this period became about one month by introducing this system. Moreover, the word that the student can select for deciding the title has been strictly limited within the range that the teacher can guide. Therefore, we thought that the demand and the dissatisfaction of the change in the title might be generated from the student.
However, they have not been generated though two months have passed since this process was begun.

V. Conclusion

In this research, the system that was the method of the learner's answering the question from the computer was developed.

The student's freewheeling thinking and discretion are limited when such a method is done, and there is an opinion of not being in the satisfaction method for the student. However, when the student's range of discretion is widened, the student who doesn't experience PBL is puzzled. And, it is expected that the period in this process becomes long, and there is an influence on the following process. However, when the student's range of discretion is widened, the student who doesn't experience PBL is puzzled. And, it is expected that the period in this process becomes long, and there is an influence on the following process. In this research, we changed the method of inputting the part of the module of the decision of the title of the system that had developed before.

In before system, the discretion of the student's input was large. There were some problems by having enlarged the discretion of the input by the student. The question posted to the student is squeezed within the range of the specialized field of the teacher who undertakes guidance in this research. The teacher becomes easy to guide the student by this method. And, the indicator when the theme is examined is clear for the student. Therefore, we think that we can shorten the time of this process.

Reference

[1] Fukuda, M., Yamashita, M., Ueyama, T., Nishimoto, M. (2010) The Trial Result of System that Supports PBL, Proc. International Workshop on E-Activity 2010, 351-356.
[2] Ikeda, M. (2010) Problem BasedLearning, http://www.cscd.osaka-u.ac.jp/user/rosaldo/061127pbl.html (accessed on January 16, 2011)
[3] Nachamma Sockalingam and Henk G. Schmidt: Characteristics of Problems for Problem-Based Learning: The Students' Perspective, The Interdisciplinary Journal of Problem-based Learning, Vol.5 Is.1 (2011)
[4] Sharifah Norul Akmar bt Syed Zamri , Lee Siew Eng: Integrating Problem-Based Learning (PBL) in Mathematics Method Course, Electronic Journal of University of Malaya,Vol.3 No.1(2005)