

공학교육에서의 웹 기반 학습과 교수방법

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1. Introduction

Internet and world wide web (WWW) have been around academic and commercial environment as a medium for exchanging information and commodity. They begin to change all aspects of life including education. Virtual universities have already challenged the traditional concept of education. Engineering education including chemical engineering should be reevaluated from the point of the new technologies. [1] The knowledge, which has been transferred from lecturers to students through voice in a classroom, is now considered as commodity and strategic item transferring through optical fiber.[2] In this paper, we will examine the possibility of using internet based on an internet-assisted lecture given at the

KAIST, and identify the key modules for constructing a web site for managing a class. Some of tools for each module are also discussed.

2. Static and dynamic modules

Internet lectures are divided into two stages. The first stage is to use the WWW as a complement of the existing lecture. This is called internet-assisted lecture. The second stage is a stand-alone lecture in which a cyber professor is involved. This will be an Internet lecture in a strict sense but, in this paper, both types of lecture are called internet lecture. The first stage is a prerequisite for a successful implementation of the second step.

The key modules for managing an internet-assisted class are identified based on the



experience managing a homepage for the chemical reaction engineering lecture at the department of chemical engineering in KAIST. The modules, summarized in Fig 1, are divided into static and dynamic modules. The static module is a part in which the content does not change throughout the lecture. The dynamic module is a part in which the content is renewed. Static modules consist of profiles of the staff, course syllabus and lecture notes. In the syllabus, the organization and the plan of the lecture, and the method of course grading are presented. Lecture notes have to be hyper-linked and searchable. It should not be a mere copy of a classroom note. Definitions and basic concepts are to be in a separated section for review. Lecture notes have to be kept in a consistent layout, and the convenience of hyper links between other sections of the notes as well as dictionary section is also important.

A search engine is an essential module for quick access to an appropriate section. When the web site is established for the first time, a scanned note is good for a while, but eventually they are to be converted into HTML (Hyper Text Markup Language), otherwise the lecture notes can not be searchable or hyper-linked. In case of equations, special Markup Language is proposed, but widely used web browsers do not support these tags. So the best way of handling equations on the web is to save them as transparent GIF images for repeated use.

Dynamic modules include grade inquiry, official announcement, Q&A BBS (bulletin board system), self-testing problems and a

reference library in which students can upload and download course-related materials. Various last minute announcements on the classroom-related events such as examinations or change of schedules are made in the announcement module. This has to be done in eye-catching manner.

3. Password protected modules

Course grade is private information, so that the access to the grade inquiry is password protected. The routine for confirming the identification is realized by CGI. A spreadsheet or a database program is used for managing scores for homework and examinations.

The Q&A module is the most important part of the web site and the most striking feature of the internet-assisted lecture. It serves to fill the communication gap between the lecturer and students as well as among students. Eventually, the Q&A becomes a searchable module, so that the module can serve as a knowledge database. The Q&A is the only way of communication between students and lecturer for the stand-alone cyber lecture. Therefore, a good pool of Q&A database should be accumulated before moving from the internet-assisted lecture into the second stage, the cyber lecture.

In the internet-assisted lecture, the assigned homework is submitted and graded by the lecturer. Only the solution is posted on the web. Examination is given at the classroom and the solution is posted on the web. But, in the stand-alone cyber lecture, homework and examination



should be done on the web. The assigned homework is submitted to the reference library and the link to the solution is posted in the Q&A module. After checking the solution by the lecturer, comments on the homework are directly posted in the Q&A. Other students also make comments on other's homework solution. Test is also conducted on the web. A password-protected self-test module replaces the classroom examination. The test result is immediately notified to the test-taking student and the wrong answers are explained right after the test.

There are many other modules that are not discussed in this paper, such as video illustration, audio/video clip of the lecture, Java applet for illustrating key concepts such as residence time distribution, and links to other homepages relevant to the lecture. As external modules, Aspen, Matlab, Maple and Mathematica are needed for solving problems and exchanging solutions.

4. Tools for module construction

Each module is constructed by using combinations of basic tools. HTML(Hyper Text Markup Language) is the primary language for the web. In the future, the more versatile XML(eXtensible Markup Language) will replace the current HTML. The XML language is a language that is capable of defining the behavior of tags, whereas the HTML accepts only the predefined tags. CGI and JAVA are used for reading input from the web, processing

them, and delivering the outcome to the web. VRML(Virtual Reality Modeling Language) is a promising tool in the future. A graphic tool and a database management program are also essential tools for the web site management. Audio and video editing program enhances the web site and is a key tool for the stand-alone cyber lecture.

5. Challenges

The outcome of the internet lecture primarily depends on the dedication from the lecturer and the teaching assistants. But the participation from the students is more important. Various eye-catching activities should be included for a successful web site management.

Connectivity to the lecture site is another factor for successful internet lecture. The current internet-assisted lecture at KAIST was almost hampered by bad network connections. The frequent network problem discourages students to be connected and have a lot more annoying than expected. Familiarity with the internet and web is also important prerequisite. Finally, the network security should be guaranteed. Otherwise, exam problems and test scores will go to the public. At worst, the whole web site may be crashed.

6. Concluding remark

The internet lecture is a promising alternative in which the labor-intensive part of the lecture is replaced by the computer and network. But it is

merely a beginning stage. Especially for the engineering education, special modules and tools are needed. For the full-scale cyber lecture, the successful internet-assisted lecture is the most important first step.

7. Reference

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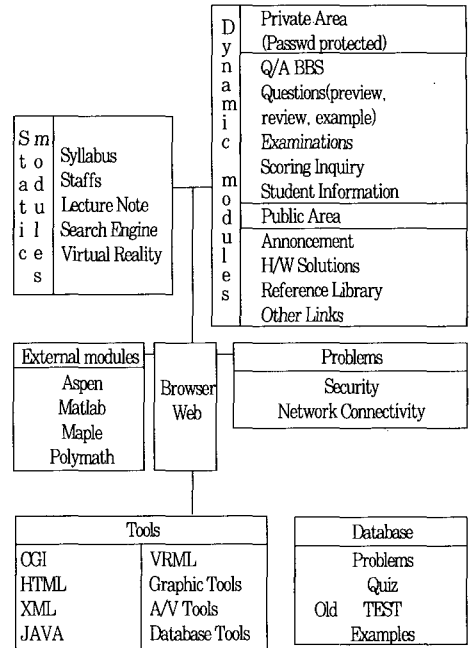


Fig 1 Key modules and basic tools for internet lecture

