

# Multiple Internet Technologies in In-Class Education

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## INTRODUCTION

The Internet has a symbiotic relationship with academia. The Internet sprung from and is continually improved by academic research. In parallel, the Internet is also changing the way academia provides education and training. Most universities now disseminate administrative information to students through the Internet. However, despite this recent upsurge in the adoption of the Internet, educational institutes have yet to fully utilize the power of various Internet technologies. Other than the Web, educational institutes have largely ignored various Internet technologies, which can aid students in the learning process.

We have to go beyond the Web and leverage multiple Internet technologies to support in-class education. Alternate Internet technologies have to be integrated under a unifying framework to make classroom-based education more efficient and effective. We need to deploy a right combination of multiple Internet technologies with appropriate teaching methods and instructional material to improve education (Huang, 2001; Mahoney, 1998; Spooner et al., 1998; Sumner & Hostetler, 1999). Web-only education support has several inherent problems. We have to deploy the framework to alleviate these problems and improve learning effectiveness yielded by the new methodology.

*Table 1. Classification of learning environments by Wilson (1996)*

- Computer Microworld: Self-contained computer based learning environment.
- Classroom-based learning environment: Traditional educational setup involving students and teacher.
- Virtual learning environment: Telecommunications based learning environment in which students are dispersed over large geographic area.

## EARLY EXPERIENCES WITH THE WEB

The Internet can provide valuable contributions to all three learning environments listed in Table 1. In the computer microworld environment, it can help distribute, maintain, and update training software and educational modules. In the classroom-based learning environment, it can help distribute course material, such as lecture notes and assignments, via course Web sites and provide e-mail-based communication between the instructor and students. In the virtual learning environment, it can replace the traditional telecommunications-based video conferencing network with a ubiquitous, multimedia network.

When the Web is used to support classroom instruction, several problems emerge. Some of these problems are listed in Table 2.

These problems create disappointment and prompt several instructors to reduce the use of the Web in their courses. To lessen these problems, off-the-shelf software products, like WebCT, TopClass, and BlackBoard, are used. However, at the time of this study, they also had their own problems such as server-based content management; they require efforts on the part of the student to check the Web site regularly and offer no support for off-line browsing. They also require reformatting of the content developed through commonly used software like Word and PowerPoint. While they do help technologically-challenged instructors to easily develop and maintain course Web sites, they do little to eradicate most of the above problems. We have to look for an alternate solution.

## INTEGRATING INTERNET TECHNOLOGIES

The above problems relate primarily to the inherent limitations of the Web and insufficient utilization of other Internet technologies. It is easy to put documents on

Table 2. Problems with using the Web

**Untimely Review of Material.** The instructor regularly updates lecture notes and assignments on course Web sites, but they are not regularly reviewed by all students.

**No Confirmation Loop.** The instructor does not always know who has reviewed the material and who has not.

**Wastage of Classroom Time.** Significant portion of the classroom time goes in discussing and resolving technical problems.

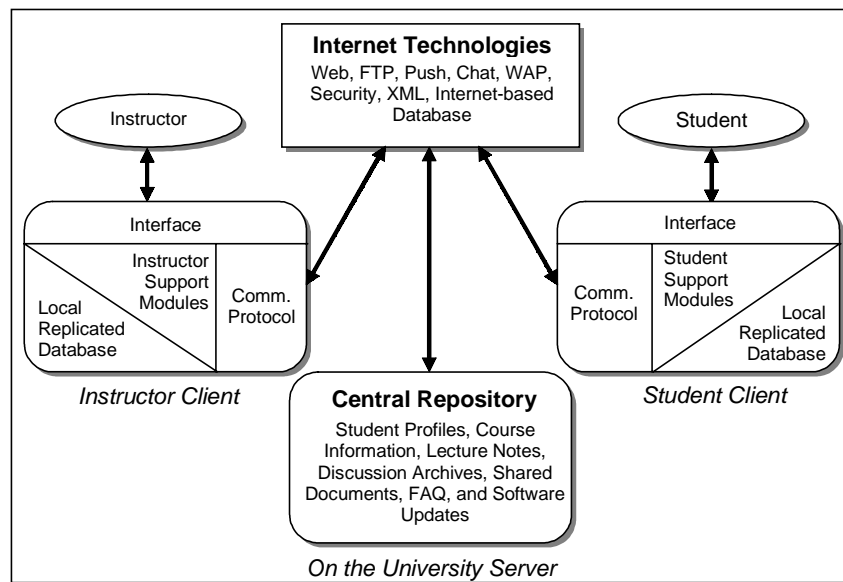
**Wastage of Instructor Time.** The instructors usually spend substantial amount of time outside of class to develop and maintain course Web site and provide technical support to their students.

**Lack of Interactivity.** Interactivity needed for many learning activities and methods, such as group discussion, case study analysis, and real-time questions and answers are not well-developed on course Web sites.

**High Cost, No Reward.** Substantial costs are involved in developing Internet-compatible course material, in terms of time and efforts, but it brings little monetary or professional rewards for the instructor.

**Varied Behavioral Response.** Some students display support for the new support technologies, while some students resist it.

Figure 1. Integrating multiple Internet technologies



course Web sites, but leveraging the full potential of the Internet requires integrating visual, aural, and textual material and providing nonlinear access to course material (Baer, 1998). Different Internet technologies will play an increasingly important role in the universities of the future (DosSantos & Wright, 2001).

This leads to the development and utilization of a novel, integrative model to support education (Figure 1, adapted from Parikh & Verma, 2002). This model goes beyond the Web to provide a unifying framework that can integrate and leverage various Internet technologies, such as the Web, FTP, chat, security, and Internet-based database in supporting education in the classroom-based learning environment. It has three main modules: central repository, which stores student and course-related in-

formation; instructor client, which assists the instructor in managing course information and administering the course; and student client, which assists students in accessing course information. Various Internet technologies connect these three modules and help perform information exchange task required for effective education.

## NEW EDUCATION SUPPORT SYSTEM

Based on this model, a new easy-to-use education support system was developed and utilized it in eight sections of various types of courses in three semesters. It was

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