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Introduction

Today's academic institutions are looking for effective approaches to leverage technology to facilitate distributed learning and support collaborative group projects. Faculty need tools, methods and best practices that can be adapted to support various learning models and learning objectives across academic disciplines.

The potential for sophisticated distance learning has been increased tremendously by the recent development of networking technologies and the Internet. While there are many attempts to utilize Internet tools in offering on-line courses, most of these tools are little more than static repositories that bring the learner to the information. Our presentation demonstrates how to use Lotus Domino server technology to build interactive web sites that will enable learners to collaborate on the Internet in distributed settings.

The Learning Model

This interactive web site is designed to support student-centered problem-based courses where faculty work as facilitators of student learning as opposed to providers of information. This model is based on the extensive research in problem-based learning which arises from a Constructivist philosophical view of how learning occurs within or is constructed by the learner as opposed to being provided by an external sources. Savery and Duffy (1994, pp 1-2) describe three critical aspects to this approach:

1. Understanding is in our interactions with the environment. Learning cannot be separated from the context in which it is learned.
2. Cognitive conflict is the stimulus for learning and determines the organization and nature of what is learned.
3. Knowledge evolves through the testing of individual understandings (hypotheses) against external sources.

From this basis, we have designed both single courses and team-taught, integrated, inter-disciplinary course clusters in which students are presented with a series of problems which they must work on in teams.

The problems presented to students are specifically designed around a set of learning outcomes that the students must address in the process of working on the problem. Problems are designed to present students with authentic situations which similar to decisions facing business professionals today. In the course of working on the problem, students must perform basic research to construct an understanding of the problem domain. This results in the generation of potential recommendations (hypotheses) which the students "test" against one another and the faculty.

The Course

The technology applications described here have been most recently utilized in an introductory MIS course within the business core curriculum. In this course students are presented with a series of four problems that must be addressed by student teams.

This model is being used both with sections of the course on the main campus and with non-traditional, part-time students located remotely on regional campuses.

Faculty Roles

In this problem-based approach the role of the faculty member shifts from preparing lectures and delivering information to designing the learning environment and interacting closely with students to facilitate learning and evaluate progress. This tends to be a more time-intensive activity and is where electronic technology is being applied to leverage time and allow for asynchronous collaboration.

Rather than interact with students face-to-face, discussion databases are used to allow faculty to provide individual feedback as well as to allow sharing of information both between students and the faculty member and between student peers. Class time is used to introduce projects, as time for students presentations and for meetings with groups and the faculty member.

Lotus Domino Server Technology

What is Domino? Domino transforms Lotus Notes into an Internet applications server. Domino ties the Notes application development environment to the open Internet protocols and standards, and allows any Web client to participate in Notes applications via the Internet. Instead of publishing databases to an external HTTP server, Domino includes both the HTTP server and an engine which converts Notes constructs into HTML in real time (see Figure 1). This creates a dynamic Web site. If a user posts information to a Domino web site, or if a developer makes design changes, these changes are immediately published.

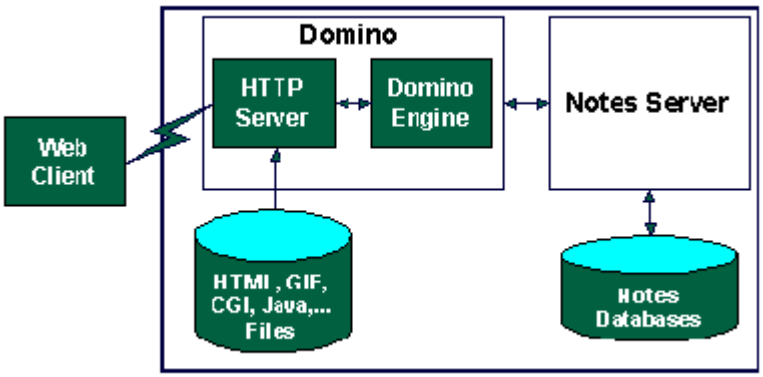

Figure 1: The Lotus Domino Server Environment

The Site

Our prototype web site uses Lotus Domino to create an integrated set of web pages and discussion databases. New information is quickly and easily integrated into the site using Lotus Notes database to store both web pages and associated images.

The faculty member constructs material using the Lotus Notes client and posts it to the database. Domino then handles the conversion of this material into HTML to allow browser clients to access the information from the web.

This means that the faculty member does not have to use HTML to publish information on the web site. Documents are created in Lotus Notes, tables can be inserted into the documents, spreadsheet data and images can be pasted into the documents, and Notes Doclinks can be created to produce hypertext links between the documents stored in the Notes database. All without any HTML coding.

The most useful Domino feature is the ability to interact with Notes discussion databases via the web. Browser clients can view threaded discussions and post topics and responses over the web. Posted items can also be edited and deleted by the author just as with the traditional Notes client.

The Notes application platform also allows for the programming of additional functionality into the site. Online user registration is incorporated into the site to give each student the ability to obtain a username and password online. This also allows Notes database security to be used to control access to the various discussion databases.

We are also developing online peer evaluation and quizzes through Notes which are then accessible over the web.

Applying the Technology

Within the problem-based learning model, Notes discussion databases are used for three primary purposes.

For students in distance education versions of the course, discussion databases are used to facilitate conversations between students and faculty with regards to the mechanics of the course and for clarification of problem assignments.

With large projects, teams of students are often given databases in which to conduct team business. This allows students to have a record of their progress on the problem and allows the faculty to track the progress of each team. This gives the faculty member insight into the team process which is rarely available in traditional team projects where the faculty member sees only the end result of the team effort. It also allows the faculty member to participate in the student team and offer advice.

The most critical database used to support the problem-based approach is a learning issues database where faculty posts general questions related to the outcomes the problem was design, the problem provides the context in which learning is to occur. In this sense, the "answer" to the problem is secondary to what the student will learn in the subject domain as a result of trying to come up with that "answer." The learning issues database is designed to ask the students to reflect on and publish the learning they have achieved as a result of addressing the problem.

The postings to the learning issues database allows students to demonstrate what they have learned and are therefore used as part of the grading process. In addition, other students can use the learning issues database as a sort of evolving "textbook" to learn concepts in the problem domain.

Conclusion

Lotus Domino has allowed us to leverage technology to support our problem-based approach. Domino simplifies the access to Notes in terms of the setup of the client. We have used Notes client in the past but Domino allows us to require students to obtain internet access which is typically much simpler than installing Notes client. Overall, we are

looking to Domino to:

- increase the speed, flexibility, reliability and reach of education,
- reduce costs associated with offering classroom education as the only delivery vehicle,
- leverage our faculty's expertise to a broader population of participants, and
- leverage team learning and collaboration in a cross-disciplinary and distributed environment.