Web-Based Instructional Learning

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<p style="text-align:center">Chapter 13</p>

Using Lotus Learning Space to Enhance Student Learning of Data Communications

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Online delivery of courses has become a viable option because of the Internet. This paper describes how we deliver and manage part of a postgraduate degree in telecommunications. We aim to foster learner-centered education while providing sufficient teacher centered activities to counter some of the known concerns with entirely learner-centered education. We use the Internet as the communication infrastructure to deliver teaching material globally and Lotus LearningSpace to provide the learning environment.

INTRODUCTION

Computer-based packages have increasingly entered the higher education curriculum. Many provide a useful supplement to students studying conventionally by illustrating aspects of the curriculum. Other packages are directed at aspects of course administration such as automated assessment (Oakley, 1996). Until recently, such packages have played only a supplementary role in course offerings,

but this is rapidly changing. For example, Coleman, Kinniment, Burns, Butler and Koelman (1998) describe a successful attempt to replace all lecturing with computer-aided learning. Remote delivery of courses has also become a viable option because of the advent of the WWW on the Internet. For example, Petre and Price (1997) report on their experiences conducting electronic tutorials for computing courses.

Hiltz and Wellman (1997) report on a study comparing student learning and satisfaction between virtual learning and traditional classroom teaching across a large range of courses. They found that mastery of course material was equal or superior to that in the traditional classroom and that virtual learning students were more satisfied with their learning on a number of dimensions. In particular, they found that the more students perceived that collaborative learning was taking place, the more likely they were to rate their learning outcomes as superior to those achieved in the traditional classroom. They did, however, identify some disadvantages to virtual learning. These included ease of procrastination and information overload.

The different types of teaching and learning activities that are made possible by the Internet are shown in Figure 1. Harasim and Hiltz (1995) divided these activities into two categories: learner or teacher centered. There is, however, no common agreement about which category is the best, and many researchers argue for a mixture of learning activities emphasising group learning. At the moment there still seems to be an overemphasis on the teacher centered approach, which hopefully will slowly change as a better knowledge of online learning develops.

Figure 1. Categories of online activities
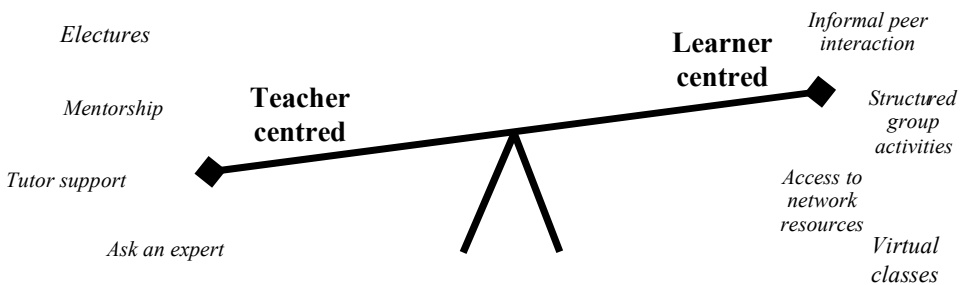
AIM AND IMPORTANT ISSUES

This paper describes how we deliver and manage part of a postgraduate degree in telecommunications management. We aim to foster learner-centered education while providing sufficient teacher-centered activities to counter some of the known concerns with entirely learner-centered education. We use the Internet as the communication infrastructure to deliver teaching material globally and Lotus LearningSpace to provide the learning environment.

While the primary aim of our approach is to enhance the student learning process, there are also other incentives to go along with this approach. From the university's point of view, it makes it possible to attract an entirely new group of students, such as industry professionals and tentative students, who due to other difficulties have problems undertaking traditional university education.

As always, there are two sides to everything. In proclaiming the advantages of online education above, we also have to be well aware of the potential drawbacks. It is even more important to have tight quality assurance of students due to the limited personal interaction between the students and teachers and the mostly unsupervised work the students produce and submit. There is also the issue of at which level to teach the course, i.e., what background knowledge is required? In face-to-face teaching the teachers usually have a feeling for the difficulties the students experience, but this is much harder to obtain with online education. These problems are compounded by the fact that students studying in a more flexible manner also often have a much wider diversity than traditional university students do. Letting students set some of the direction for the class isn't always an easy task. When students are afforded the opportunity to define some of the course objectives, the role of the instructor shifts from the pedagogical model of the instructor as "keeper of knowledge" to that of a guide and supporter. The instructor must ensure that the competencies and skills required for moving to the next level of learning and those necessary for meeting program objectives, and in our case also industry certifications, are included in the course goals.

At a more basic level there are issues, such as the fact that reading from the screen slows down reading speed by about 25% and most people prefer paper for long works (Nielsen, 1995). We also have to be aware that courses that require hands on experience limit the number of courses suitable for online education, although on-campus attendance one or a few times per semester can provide a solution to this problem.

REQUIREMENTS FOR A COURSE DELIVERY SOFTWARE PACKAGE

After defining the requirements for a software tool for developing and delivering courses online, we evaluated various software packages on the market. The requirements that we identified included:

- Instructors should not have to program and debug HTML code;
- All courses should have the same professional look and feel without having to hire computer programmers to write special software, and students should always be presented with the same interface for all their courses;
- The software needed to be fully integrated (one software package should allow the instructor to do everything required, such as course development and course management); and
- Professional support.

After evaluating various alternatives, we chose Lotus LearningSpace (LS), as it fulfilled all of our requirements. It contains tools to develop the curriculum that do not require the instructor to code in HTML. This allows the instructor to focus on the learning of the students rather than on creating and debugging HTML and on unit administration. LS provides instant feedback to the students and instructor and enables progress and problems that students encounter to be monitored as they go through the curriculum. Students can also have a discussion area where they can ask questions and communicate with the instructor as well as with other students.

LS allows us to create distributed learning courses that students and instructors can access whether they are online or offline. Students are able to download all the material for the course onto their machine so they can go through the curriculum without having to have a direct Internet connection. Using the offline access method makes it easier for students to learn whereever they are located and for instructors to develop and manage course material and reduce critical network bandwidth requirements.

Features that facilitate student learning include:

- *Schedule* – provides students with a structured approach to assignments, materials, and assessments. Through the schedule, students can link to everything required to complete their course.
- *MediaCenter* – allows immediate and searchable access to all materials for the course as the instructor makes them available.
- *CourseRoom* – provides a discussion group facility, which hosts collaborative interchange between student groups and/or students and instructors.
- *Profiles* – helps students and instructors get to know their classmates to form productive teams and to network outside the course.

Features that facilitate course management include LS Central for course management and the Assessment Manager for setting up and tracking of students' progress in their courses.

USE OF LS TO DELIVER ONLINE COURSES

In 1999, half of the courses in the Masters of Science in Telecommunications Management were offered online. We offered more courses online in 2000 to compliment the six existing online courses so that students could complete the full Masters degree online (some of the online courses have on campus requirements).

Students can access LS with a Lotus Notes Client or through a web browser. The Lotus Notes Client allows students to work offline by placing an image of what is on the LS server on their laptop or PC at home. This allows students to work while they travel and can reduce the amount of time they are required to be connected to the Internet (some countries have timed local calls). When they connect up to the Internet they can resynchronize their copy with the master copy located on a Lotus Notes Server.

LS has been used to integrate course material from a variety of sources. For example, in several of the courses students study material that contributes to different industry certifications, such as the Cisco Certified Network Associate certification (CCNA). This kind of external material must be integrated seamlessly with local content so that students see a totally integrated system when it comes to the delivery of each course. Students also have a consistent learning environment across the courses so that no time is wasted learning a new system as they start a course.

All quizzes are done online and all assignments (including group assignments) are submitted electronically and returned to students electronically. The online Cisco exams are done on separate assessment servers, as they are part of the certification process. The Cisco Networking Academy results of all the students around the world are maintained in a database in Arizona so that instructors can analyze how their class has answered questions and compare the results of their students with those of students in other institutions around the world.

Students get immediate feedback when they submit their quizzes and exams for grading online. Assignments are graded locally and returned with the instructor's personal comments and grade. The final exams for each course are taken locally in a more traditional way. The students may actually get two final exams, one to pass the university course and one administered by an independent testing center to pass the industry certification. Students could fail or pass both as well as pass one and fail the other. The integration of the two curriculums gives the students

their credits in the university degree as well as the opportunity to pass the industry certification as a "bonus".

We use LS to monitor the progress of on-campus and off-campus students in courses and to identify the areas where students are having problems. This allows instructors to cover the material again as necessary to make sure that the students do understand the material. Testing and checkpoints with built in repetition are important for long term retention and understanding of the material. Students also use LS to track their own progress and performance in the courses.

As mentioned above, the intention is to be able to offer the same courses to the students irrespective of their location. However, a few practical things and student attitudes towards some of the features differ slightly. For example, on-campus students tend not to use the online CourseRoom facility that contains threaded discussions as much. However, the off-campus students tend to rely heavily on this for interaction with other students and the instructor. The instructors tend to try and only answer questions in the discussion groups, because this reduces students sending emails to the instructor asking the same questions. The instructors will usually refer students back to the CourseRoom. This requires a well working discussion group with some kind of search engine to be effective.

AN EXAMPLE OF THE ONLINE APPROACH

Depending on course content, the migration to online teaching can be more or less laborious. There are differences within as well as between disciplines, and there are differences in the goals set by those introducing online education. We have chosen one course in the Telecommunication Management degree to provide an example of how online teaching was implemented. Appropriately, this course is about networking technology.

The Data Communications Systems course provides an introduction to networking and networking devices, focusing on Local Area Networks (LANs) and Wide Area Networks (WANs). Network design, Ethernet, ISDN, Frame Relay, and TCP/IP are introduced, including IP addressing and router protocols. There is a strong practical context that provides the students with the opportunity to build, configure, and problem solve in a multi router network environment. This course also includes the first part of the Cisco Certified Network Associate (CCNA) curriculum. The second half of the CCNA curriculum is covered in a second course, the Advanced Data Communications course. The Data Communications Systems course provides a good example of a difficult class to integrate with LS because of the external curriculum, which is contained on a separate web server, and the external assessment requirement for students.

Students are required to login to LS once they have selected the Data Communications Systems course. The students use LS schedule to follow the schedule for the course. Through the schedule, students can access the external curriculum, which resides on a separate web server.

Theory is presented to students in the form of online topics (web-based), mini lectures, and laboratories. The online teaching material combines web-based text and graphics to explain concepts. Short movies, shown on their screen, are also used to illustrate concepts that are difficult to communicate with just static text and graphics. The students are given aims and objectives at the start of each topic. The teaching material covers these topics in detail, and at the end of each topic students have optional self-assessment quizzes that allow them to gauge their understanding of the material. Students are required to have gone through the online material and additional reading before class.

Instructors also use these online quizzes in LS to measure the understanding of the students before the students attend the class. As students work through the curriculum, they are required to pass formal quizzes for each module (eighty modules in total). This allows students and the instructor to receive important feedback. The instructor is able to identify students who are not keeping up to date with their work and also areas that students are having problems with. The questions in the quizzes are directly linked to objectives for each module. Students have to achieve a pass of 80% on each quiz, otherwise they are required to repeat the quiz until they achieve 80% or better. Detailed answers to the questions are not made available, so students are required to go through the curriculum again to make sure they understand all the material, not just the questions they missed.

The instructor is able to compare how each student has performed on the quizzes, so this allows them to identify areas where students are having problems. The mini lectures for on-campus students can then focus on the areas where these students are having problems. The instructor can also discuss areas where students are having problems in the discussion group. Students are required to participate in the discussion group because part of the total grade is based on participation. There are two Cisco online exams for the course, and students are required to pass these exams with a minimum score of 80%. Students are allowed to take the exam more than once. All students must also take a separate supervised written final exam to meet University requirements.

The philosophy used in the practical labs is to prepare students to solve real world networking problems. Students work in groups during the practical lab sessions. Students are given timed practical exams at the end of each major component, and some of these practical exams are groups exams. Students are al-

lowed to take these exams as many times as they like but are required to pass all these exams. Distance education students are required to attend an on-campus part of the course. During this time they are required to design and implement networks and troubleshoot network problems and take the practical exams. The distance education students also take the two required Cisco online exams during this on-campus part of the course for supervision reasons.

The factors discussed above all contribute to facilitating student learning. Faster and more frequent feedback on the material keeps students more in touch with their progress. The facility to continue to work with the teaching material until an 80% pass is achieved enhances performance. Students see important material three times so that their learning is reinforced and students are able to study wherever they are and still be part of the student community. The use of a virtual discussion group will enhance the sense of community among the students and teachers. Combining a learner-centered approach with LS allows us to achieve a quality course online.

CONCLUSIONS

This paper discussed an approach used to adopt a learner-centered environment within an Internet-based degree. We do not believe that online teaching and computers are a substitute for a human interaction, but rather that technology can provide flexibility of learning and hence enrich the learning experience and diversify the student mix. As the courses used to illustrate the issues in the paper are about telecommunications, the Internet is a very appropriate medium for instruction. Students learn about telecommunications while accessing information through the Internet. There are, however, a number of important issues to take into consideration while setting up an online course. For example, just converting teacher-centered material to electronic form doesn't work. It doesn't make use of the technology available today in an optimal way. The opportunity to adopt a more learner-centered approach should be taken by including, among other things, well-structured group activities and virtual discussion groups. The electronic classroom challenges instructors and students to move beyond the traditional boundaries of learning and presentation. Online education projects may in many ways be the motivational tool that instructors have sought for a long time, for both on and off-campus students.

REFERENCES

Coleman, J., Kinniment, D., Burns, F., Butler, T., and Koelmans, A. (1998). Effectiveness of computer-aided learning as a direct replacement for lecturing

in degree-level electronics. *IEEE Transactions on Education*, *41*, pp. 177-84.

Harasim, L., and Hiltz, S. R. (1995). *Learning networks: a field guide to teaching and learning on-line.* Cambridge, USA: The MIT Press.

Hiltz, S. R., and Wellman, B. (1997). Asynchronous learning networks as a virtual classroom. *Communications of the ACM*, *40*, (9), pp. 44-49.

Nielsen, J. (1995). *Multimedia and hypertext: The Internet and beyond*. Boston, USA: AP Professional.

Oakley, B. (1996). A virtual classroom approach to teaching circuit analysis. *IEEE Transactions on Education*, *39*, pp. 287-96.

Petre, M., and Price, B. (1997). *Programming practical work and problem sessions via the Internet*. ITiCSE 97 Working Group Reports and Supplemental Proceedings, pp. 125-28.