

THE APPLICATION OF WEB-BASED PROJECTS AND DISCUSSION BOARDS IN AN ONLINE ENGINEERING MANAGEMENT PROGRAM

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Abstract

Educators have, for many years, noticed that some students prefer certain methods of learning. These traits, referred to as *learning styles*, form a student's unique learning preference and aid teachers in the planning of small-group and individualized instruction. The purpose of this study was to compare the student learning styles of an online graduate course "Optimization Methods" with an equivalent on-campus class at the University of Tennessee at Chattanooga (UTC). The main reason for this study is to define the variations in learning styles and analyze the differences of learning levels between online and on campus students. This study was mainly focused on the semester projects assigned in class, in which the project teams made by the combination of online and on-campus students. The results showed that students who enrolled in the distance education class received the same level of knowledge and understanding with the students in the equivalent on-campus class by the end of the semester.

Introduction

Today's academic institutions are in transition. Much of the change is due to economic pressures from mounting costs and demands by the business world for graduates with the ability to function well in a knowledge society. How are universities responding to these changes and demands? Institutions of higher education are, with increasing frequency, turning to the use of the Internet to deliver courses to students at a distance, as well as to enhance educational programs that are delivered on campus. As technology comes into a greater use, faculty and students alike are grappling with the changes it brings to the educational environment. Courses and degree programs are being offered over the Internet.

Web-Based Courses

Distance learning in various forms has been around for a long time, but until recently the ability to offer online courses to large numbers of individuals was not available. Traditional distance learning environments were based on correspondence through passive media (paper, audio and video broadcast). Recent developments in network and communication technologies have offered opportunities to improve these environments through increased communication, interactivity among participants, and incorporation of

collaborative pedagogical models. Other advantages to using this type of distance learning include (Khan, 1997):

- Instantaneous (synchronous) and delayed (asynchronous) communication modes
- Access to and from geographically isolated communities
- Multiple and collaborative participation among widely dispersed individuals
- Ultimate convenience, when and where you choose
- Interaction with and among individuals from diverse cultures, and
- Ability to focus on participants' ideas, without knowledge of age, race, gender, etc.

Boettcher and Conrad (1999) define the web-based courses as courses in which material is placed on a web site, allowing students to access at anytime during a given period and allowing for larger enrollments per class but little or no interaction between students. Many institutions have adopted courseware that they ask faculty to use in order to simplify and unify course management and to minimize technological difficulties. Current course authoring software generally allows faculty to upload a syllabus that has been created in a word processor and create asynchronous discussion areas for large and small group discussion and places where students can post assignments. They also offer e-mail and grade book, in which faculty can record grades and students can monitor their progress in the course. Other features might include the ability to use limited audio and video and a whiteboard by using different software and/or tools, such as MIMIO, which is widely used in the Engineering Management program at UTC.

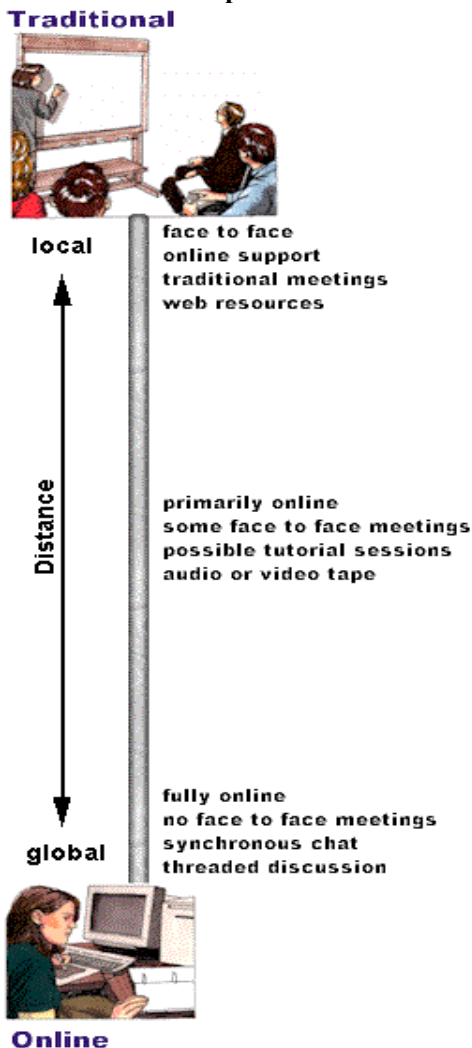
Online Students. The California Distance Learning Project (1997) reviews some of the research on successful students in distance education programs and suggests that students who are attracted to this form of education share certain characteristics. They:

- Are voluntarily seeking further education
- Are motivated, have higher expectations, and are more self-disciplined

- Tend to be older than the average student
- Tend to possess a more serious attitude toward their courses

The world of graduate and continuing education has changed dramatically and we are now given many choices of where, when, and how to pursue lifelong learning as shown in Exhibit 1. One end of the continuum is a traditional face-to-face course, with online support. As we move toward the center of this continuum, we might find a course that is more typical of a distance education class. It may be an online class that is enhanced with local meetings, or with one or two group tutorial sessions. Finally, at the other end of the continuum, we might find a totally online course. The participants never meet physically, and the course interaction takes place through a variety of tools.

Exhibit 1. Course Development



Technology. The selection of distance learning technologies should involve the assessment of course content, learning outcomes, and interaction needs. Olcott (1999) provides what he calls five “I’s” of effective distance teaching: interaction, introspection, innovation, integration, and information.

Interaction refers not only to the communication that should occur between the student and the instructor and the student with other students but also the interaction between the students and the content of the course. Thus, asynchronous and synchronous communications as well as the presentation of print materials and links to the Internet from the technology needs of interaction. *Introspection* is the interpretation, revision, and demonstrated understanding of concepts. Discussion boards and graphics can be effective technologies to encourage introspection. *Innovation* refers to the ability of instructors to experiment with technologies to address various learning styles. Thus, combination of audio, video, and asynchronous discussion can provide various opportunities for students to learn. *Integration* reflects the integration of facts, concepts, theories, and practical application of knowledge. Using case studies, print exercises, and role-play can create a setting in which integration can occur. *Information* refers to the knowledge and understanding that is a prerequisite for students to move to the next level of learning.

Based on the above explanation, any form of technology can be used to deliver a course. What is more critical to a successful online course is good, learner-centered teaching. Consequently, when choosing the forms of technology to be used in a course, the first consideration should be the outcomes to be achieved as well as the technology used by students. Therefore, when instructors choose to use other forms of technology, such as audio, video, chat, and whiteboards, they must consider what their students are able to receive. Slow Internet connections and older, slower computer hardware and software prove difficult or impossible to use when attempting to access more complex course sites, causing frustration on the part of both students and instructors.

Blackboard. The course authoring software used at UTC is Blackboard, which provides a framework to organize a web-based course. Blackboard serves more than 3,300 colleges, universities, K-12 schools and other organizations in every state and in more than 70 countries. More than 2.1 million people worldwide teach and learn using Blackboard.

The Blackboard website at the University of Tennessee at Chattanooga is <http://utconline.utc.edu>. The online course that has been prepared using the Blackboard program contains all the necessary

information about the course; such as the syllabus, course material, grade book, discussion board, related links, communication link, audio and video files, etc.

Teamwork. An important element of community; whether it is face to face or in the electronic realm, is the development of shared goals (National Research Council, 2001). Clearly, in the web-based classroom, those goals should relate to the learning process. There are different techniques to move students in the direction of embracing a shared goal, beginning with the guidelines early in the course and continuing through an end-of-course evaluation of how well those goals were met.

There are several purposes of creating teams in the web-based classroom (Palloff and Pratt, 2001):

- To provide small-group discussion
- To complete group assignments
- To engage in small-group activities and simulations.

Analysis

Since Fall 2001 the Master of Science in Engineering Management Program has been offered through the Internet. The online masters program is designed to enable students with access to a computer and the Internet to take courses at a time and place that fits in their own schedules. Just as in traditional on-campus courses, there are reading and writing assignments, tests, and transferable unit credits. The big differences are in the delivery of the course content and in the ways students interact with their instructor and each other. Most online courses use a combination of text and images files, taking advantage of hypertext to make the experience more interactive (Porter, 1997). Some courses add audio and/or video files to the mix. Some courses may require one or more on campus meetings, but for the most part, students and instructor communicate through email, bulletin boards, discussion boards, and/or chat rooms.

Case Study. The application of such a system will be demonstrated by using a graduate course, ENGM 504 "Engineering Optimization Methods." This course is offered in two different sections, one on campus and one on the Internet. The course material and requirements for both courses are the same. Group projects required for the course are designed by the combination of on campus and Internet students in order to analyze the differences of the learning levels for both types of students.

Engineering Optimization Methods is an elective course in the MS in Engineering Management program. The course is offered once a year, during the fall semester. The students' backgrounds are generally

from engineering, computer science, business, science, etc. The class size is generally between 15-20 students for this course. There is no regular meeting time for the Internet course, but students are always welcome on campus sessions if they want and if it fits in their schedule. The regular on campus class meets once a week in the evening between 5:30-8:00 p.m.

The course description is the engineering and mathematical optimization techniques for engineering and engineering management applications. Some of the topics in this course are optimization techniques, linear programming, simplex solution, transportation, decision analysis, integer programming, goal programming, network flow models. The course is heavily quantitative in which four different computer programs are taught, Excel Tree Plan, Excel Solver, LINDO (Linear programming), and DSWin (Decision Sciences for Windows). The grading policy for the course is the same for both sections:

- Examinations (40%)
- Quizzes (10%)
- Assignments (20%)
- Semester Project (20%)
- Class Attendance and Participation (10%)

For the semester project, the instructor forms several student teams. Each team is made by 3 or 4 students with the combination of on campus and Internet students. The instructor assigns different real-world case problems to each team. The following list is the guidelines for the team:

- Each team will designate/elect/appoint a team coordinator/leader.
- Students in each team will use the designated group page on the Blackboard to communicate each other.
- Team members will exchange files and use the discussion board in their group page.
- Instructor will be the virtual team member of each group and can access to the group pages.
- Each team will prepare a single report and give a presentation.
- Team members should be present during the presentation either by being in class or by participating with multimedia features.
- Team members will evaluate each other's work, participation, and contribution to the collaborative product that ensues from their work together.

The purpose of the project is to give students experience in all aspects of problem solving involving complicated situations. In conducting this project

students obtain practical knowledge about how to quantify aspects of an organization's operations, how to deal with ambiguity, how to draw managerial insights and conclusions from a quantitative investigation, and be able to demonstrate such learning in a report and an oral presentation.

Each group has a separate group page in Blackboard. This group page can be used by just group members and the instructor. Each page has three main links:

- Discussion Board
- File Exchange
- Send E-Mail

Discussion Board is used to discuss the topics and questions, and to share the ideas about the case. File Exchange is mainly used to exchange the completed files, such as answers to questions, parts of the report, etc. E-mail is used to send messages to one or more group members. The instructor's role in the group is to see the overall interaction among group members and answer some of their questions if there is a need.

Pros and Cons of Mixed Teams. Students who know or do not know each other begin to form new relationships for their project. Each student's contribution is recognized and appreciated by the group. Consequently, their ideas may be supported and expanded, or they may begin to branch off in another direction of inquiry. As a result, they begin to develop new ways of explaining their ideas and the material with which they are interacting (Palloff and Pratt, 1999). This creates a web of learning environment through which new ideas and means of reflection provide a feedback mechanism regarding the ideas being studied and the learning process itself.

The Advantages of Mixed Teams:

- Variety of learning levels
- No need for the actual meetings
- Availability of sharing ideas through the Internet
- No time constraint
- Easy to edit files that are exchanged

The Disadvantages of Mixed Teams:

- Lack of interaction
- Difficult to upload large files
- Different speed of connectivity to the Internet

Results and Discussions

The results of students' learning levels and styles are analyzed according to the followings:

- Team performances based on both written report and oral presentation
- Usage of group pages in Blackboard
- Student performance tracking
- Peer evaluation

Each group had different approaches to analyze the case. Group members were meeting at least once a week to discuss the issues related to the case, but if an online student was living out of city, he/she could not attend the meetings physically but could interact by using the chat room or discussion board. Students did not have any complaints about the interaction. They were able to handle this by using the features that are available in Blackboard. The knowledge and learning level of each student was not related to being an online or in-class student; it was mainly related to the student's learning ability. If a student is motivated and organized, he/she can learn at the same level as in a class student. This study also revealed that the grade point average of online students was higher than in-class students.

Blackboard provides rich capabilities for student learning data within a course. The student performance was closely analyzed for each group. Frequency that students participate in discussion board activities in each group, usage of file exchange link, and the overall time spent in each group page revealed that online students had the highest usage level compared in-class students. Peer evaluations conducted for the project had three main areas of questions: attendance, participation, and preparedness. The results revealed that online students were as much prepared and participative as in class students and they were also able to attend the meetings by chat room, discussion board, or phone.

Conclusions

The mixed team developed by both the Internet and on campus students were a great success. The on campus students became more active on the web-based learning. Peer evaluations revealed that Internet students did not have any lack of knowledge about the material taught in the course, which was showing the great success in terms of web-based education. Students used all tools in the web-based learning environment. Students who could not participate to the presentation recorded their narration on the presentation and added their pictures, which provided a learning environment that everybody could be a part, even without their physical existence.

References

Boettcher and Conrad, *Faculty Guide for Moving Teaching and Learning to the Web*, Mission Viejo,

California: League for Innovation in the Community College, 1999.

Khan, Badrul H., *Web-Based Instruction*, Educational Technology Publications, 1997.

National Research Council, *How People Learn*, National Academy Press, 2000.

Olcott, Instructional Technologies-Part Two-Strategies for Instructor Success-Selecting and Using Distance Education Technologies, *In Teaching at a Distance: A handbook for Instructors*, League for Innovation in the Community College and Archipelago, 1999.

Palloff, Rena A. and Pratt Keith, *Building Learning Communities in Cyberspace*, Jossey-Bass Publisher, 1999.

Palloff, Rena A. and Pratt Keith, *Lessons from the Cyberspace Classroom*, Jossey-Bass Publisher, 2001.

Porter, Lynnette R., *Creating the Virtual Classroom*, Wiley, 1997.

The California Distance Learning Project, <http://www.otan.dni.us/cdlp/cdlp3/cdlpadultlist.html>, 1997.

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Dr. Neslihan Alp received her Ph.D. from University of Missouri-Rolla in Engineering Management. She worked as a Post Doctorate Fellow at the University of Missouri-Rolla for 2 years after completing her Ph.D. She holds an M.S. degree in IE and a B.S. degree in Engineering Management from Istanbul Technical University. She is currently an Associate Professor in the College of Engineering and Computer Science at the University of Tennessee at Chattanooga. Her research interests are in quality control, project management, operations research, layout design, lean manufacturing, six-sigma, distance education, and web-based course development process. Dr. Alp is a registered professional engineer in the State of Tennessee.