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AUTHOR	Dvorak, James D.; Buchanan, Karen
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ABSTRACT

Oklahoma Christian University has implemented a ubiquitous computing program where every student and faculty member are equipped with IBM ThinkPad laptops that are connected to a wireless network. The technological enhancements provided by this program helped to create an environment where collaboration between students and faculty could be increased. During the first full year of implementation, one course typically taught in a lecture-based format was re-designed to foster more collaboration and active learning. The instructor enhanced the course with collaborative technology, delivered most of the first exposure to the materials online, and created collaborative assignments to be done during the classroom time. A survey and several interviews were conducted to glean student feedback. Students found the course challenging and they rose to meet that challenge. (Contains 18 references and 1 table.) (Author)

Using Technology to Create and Enhance Collaborative Learning

James D. Dvorak
North Institute for Educational Technology
Oklahoma Christian University
United States
jim.dvorak@oc.edu

Karen Buchanan
Director of Teacher Education
Cascade College – Branch Campus of Oklahoma Christian University
United States
kbuchanan@cascade.edu

Abstract: Oklahoma Christian University has implemented a ubiquitous computing program where every student and faculty member are equipped with IBM ThinkPad laptops that connected to a wireless network. The technological enhancements provided by this program helped to create an environment where collaboration between students and faculty could be increased. During the first full year of implementation, one course typically taught in a lecture-based format was re-designed to foster more collaboration and active learning. The instructor enhanced the course with collaborative technology, delivered most of the first exposure to the materials online, and created collaborative assignments to be done during the classroom time. A survey and several interviews were conducted to glean student feedback. Students found the course challenging and they rose to meet that challenge.

Introduction

Oklahoma Christian University is blazing a new trail with the e-campus concept instituted in the Fall of 2001. "The new technologies provide opportunities for creating learning environments that extend the possibilities of "old" (Bransford et al., 1999). Oklahoma Christian launched its wireless e-Campus in the Fall of 2001 by distributing IBM ThinkPads with wireless networking capabilities to every full-time student. It is the first university in Oklahoma and one of the few nationwide that offer to all students a wireless campus and laptop computers. Students can access the Internet or myOC (the university's personalized, web-based portal) from virtually anywhere on campus. Such a culture change affects not only students, but also faculty. For some, this culture change is an easy adjustment; for others, a seemingly insurmountable hurdle. Yet, the change affects everyone and it demands adjustments in the way teachers teach and students learn.

The use of technology does not guarantee that effective learning will occur in a course. Bransford, Brown and Cocking (1999) say that technology can, in fact, hinder learning if used inappropriately. However, when used appropriately technology can connect teachers, the instructional experience, and learners in ways that enhance learning (Newby, et. al. 2000). The goal of this collaborative effort is to use technology as an instructional intervention in the creation of an effective learning environment that is based on current research regarding how people learn.

Integration of Pedagogy and Technology

The Office of Educational Research and Improvement of the U.S. Department of Education charged a 16 member committee with the task of evaluating new developments in the science of learning (Bransford, et al., 1999). This committee reviewed research and consulted with experts in the process of

reporting the most current information regarding how people learn. Their recommendations are instructive for all educators.

These new conceptions of learning have created a shift from an emphasis on rote learning and repetition to a focus on depth of understanding and the ability to apply new knowledge. The implications of this new focus require new or renewed instructional interventions and learning environments (McLaughlin and Shepard, 1995).

The foundation of the classroom model that follows is a learner-centered approach to education. This model is steeped in collaborative learning and has a strong emphasis on formative assessment (Poindexter et. al, 2001). This discussion continues by exploring each aspect of this model course.

"Learner-centered" environments value the knowledge, skills, attitudes, and beliefs that learners bring with them to the classroom (Bransford et al., 1999). The conceptual knowledge and beliefs that students bring to the classroom are the starting point of instruction. The pre-assessment in the model class purposefully investigates the knowledge that students are initially bringing to this course.

Learning is greatly influenced by the context in which it occurs. Instructors are charged with creating a learning community that facilitates students sharing their preconceptions, questions, and taking learning risks in pursuit of academic growth. Cooperative and collaborative learning are strongly supported instructional tools in the research literature. They have been shown to lead to cognitive development (Johnson and Johnson 1984; Slavin, 1991; Sharan and Sharan, 1989/90; Bransford et al., 1999).

The model course that follows requires students to read and listen to lectures outside of the classroom so that classroom time can be spent on collaborative pursuits. Students are placed in learning teams as they work through multiple milestone assignments. They will also produce a capstone project. The instructional technology embedded in the course encourages collaboration beyond the four walls of the classroom. Students may use Microsoft NetMeeting to work together online, as well as communicate and collaborate with the instructor. Synchronous chats, message boards and email will provide students with the opportunity to receive feedback from peers outside of their learning team. The instructor will serve as a guide, but students will be charged with directing their own learning. Student-involved learning has a strong link to academic achievement (Stiggins, 2001).

A unique and innovative aspect of this course is its use of formative assessment. Educators of the twenty-first century are functioning in an assessment climate that is almost completely focused on summative assessments (Stiggins, 2001). While these summative assessments provide very specific information about what students know, they do little to promote learning (Gallagher, 2000; Stiggins, 2001). Dylan Wiliam (2000) defines summative assessment as assessments that are "used to certify student achievement or potential" (p. 1). He goes on to describe formative assessments as assessments that "provide feedback to learners about how to go about improving" (p. 1). Crooks (2001) talks about formative assessment as assessment *for* learning. Several research projects highlight the connection between formative classroom assessment and academic achievement. Professor Terry Crooks (1988) of the Univeristy of Otago, New Zealand conducted a synthesis of over 200 studies on the use of formative assessment. He concludes that formative classroom assessment can have a very positive impact on student achievement. He further chronicles the connection between classroom assessment and student decision-making. "The decisions students themselves make, he (Crooks) contends, are the decisions that determine what is learned (Stiggins, 2001). "It [classroom assessment] guides students' judgments about what is important to learn, affects motivation and self-perception of competence, structures their approaches to and timing of personal study...consolidates learning and affects the development of enduring learning strategies and skills" (Crooks, 1988, p. 267).

English researchers Paul Black and Dylan Wiliam (1998) conducted a meta-analysis of more than 40 controlled studies centered on the impact of improved classroom assessment on student achievement as reflected in summative assessments. They asked three questions in this project:

- Is there evidence that improving the quality and effectiveness of use of formative assessments raises student achievement?
- Is there research evidence that formative assessments are in need of improvement?
- Is there evidence about the kinds of improvements that are most likely to enhance student achievement?

The results conclude a resounding "yes" to all three questions. The results cross all content areas, knowledge and skill types and all levels of education. Results reveal unprecedented gains in achievement. They report effects between 0.4 to 0.7.

> An effect size of 0.4 would mean that the average pupil involved in an innovation would record the same achievement, as a pupil in the top 35% of those not so involved. An effect size gain of 0.7 in the recent International comparative studies in math would have raised the score of a nation in the middle of the pack of 41 countries (e.g., US) to one of the top five.
>
> (Black and Wiliam, 1998, p. 141).

Strong evidence supports the use of formative classroom assessment. This model course provides multiple opportunities for students to receive feedback from the instructor and fellow students so they can adjust their learning. It also provides opportunity for the instructor to assess students and then make instructional decisions based on those assessments.

Current research encourages educators to "Explore the potential of new technologies that provide the opportunity to incorporate formative assessment into teaching in an efficient and user-friendly manner" (Bransford et. al., 1999, p. 39). This model course is an exploration of that potential.

Case Study Context

The model course consisted of 37 freshman-level students. Eighty-three percent of the students were between 18 and 20 years old; 10 percent were between 23 and 24 years old; and 7 percent were 25 years old or older. Sixty percent of the class was male, 40% were female. There were only three international students in the course, one from Venezuela, one from Australia, and the third from Africa. Ninety percent of the students lived on-campus and, therefore, had 24/7 access to the technology described above.

The model course was designed to make heavy use of technology, yet the technology was meant to be "transparent," used as a tool of the trade (much like a pencil or textbook). Priority was given to student learning. If the technology inhibited student learning, it was changed or removed. This course was designed so that it could be offered as a hybrid course (i.e., a course that has both F2F and online components) or as a distance education course.

The course followed a 20/80 rule (sometimes 10/90), meaning only be about 20% of face-to-face (F2F) time was used for lecture while about 80% of the F2F time was designated for students to collaborate on assignments or for in-class presentations (Poindexter et. al., 2001). To accomplish this, every lecture meant to give the students first exposure to the material was moved outside the classroom and into the Blackboard course management system (Walvoord & Anderson, 1998). Each lecture was accompanied by the instructor's notes. The learners logged into the Blackboard course site, clicked into the lecture area, and listened to the lecture prior to the class meeting. These lectures consisted of digital audio of the instructor (or guest lecturer), accompanied by PowerPoint slides which were synchronized with the recording. The student could stop, play, pause, or resume these presentations. Moreover, s/he could jump ahead or back in the presentation by clicking a hyperlink to the desired slide. These lecture materials were available to the students for the entire semester (and beyond) and could be reviewed at the discretion of the student. After listening to the lecture, the students took quizzes over the material that was introduced (all quizzes will be given online using the built-in assessment feature in Blackboard). The instructor reviewed the scores of this assessment and adjusted the 10%-20% classroom lecture time for remediation as necessary. Other than these quizzes, no exams were given in this course.

The students were grouped into teams in order to collaborate on assignments and the final project. The groupings were based on several criteria:

- results of the Keirsey version of the Myers-Briggs temperament analysis
- learning styles
- self-selection (limited)

(Poindexter et. al., 2001)

Teams collaborated on multiple milestone assignments and one final project. The milestone assignments demonstrated the learners' abilities to identify and accomplish the steps in the interpretive process. Each team chose a passage from *The Acts of the Apostles* and they worked on that text throughout the semester. These passages were the subject of the milestone assignments as well as the final project. The milestone assignments were primarily written assignments, but occasionally students were asked to present their work in class.

The final project had two parts. First, each team submitted an interpretation paper to their instructor in which they offered and defended an interpretation of the passage from Acts they chose. Next, each team gave an in-class presentation of their interpretation. This presentation required the use of a technological medium for its delivery. The student could have chosen from PowerPoint, digital video, web sites, or some other digital medium. Their presentations could not exceed 20 minutes in length, in order to allow time for critical peer review. The team of students filled the role of teacher during these presentations.

The instructor provided several ways for students to communicate with him and even collaborate on assignments as necessary. First, Blackboard has many built-in features to allow this: e-mail, message boards, and the virtual classroom (i.e., synchronous chat), to name a few. Moreover, the instructor had embedded Microsoft NetMeeting into a web page and uploaded it to the Blackboard course site. He pre-configured the software to call his computer at the click of a button. NetMeeting allowed the learners to call the instructor over the Internet and collaborate with the him on the assignment or to simply receive feedback. For example, if a student needed feedback on a milestone assignment, s/he may call the instructor using NetMeeting. NetMeeting allows application sharing over the Internet, so s/he could open the word processing application, share that application through NetMeeting, and give control to the instructor. Then the instructor could actually mark up the student's document with comments, suggestions, and corrections as necessary. This allowed for more than just feedback; it also allowed the student (or team) to actually collaborate on an assignment with the instructor.

The instructor provided several ways for the team members to collaborate as well. First, they, too, could have used NetMeeting for collaboration in the same manner described above (NetMeeting allows multiple users to connect with each other). Next, the instructor enabled the groups feature in Blackboard. Each group could collaborate using message boards, chat, e-mail, and file sharing—all of which are built into Blackboard. Each team had its own message board, chat room, e-mail address, and digital drop box, and those tools were only open to members of the same team.

The instructor provided all reading and research materials to the student in at least one of the following ways:

- digital format via Blackboard (articles will be scanned to PDF and uploaded to the content areas of the course web site in Blackboard)
- on reserve in the university library
- links to content available on the Internet and World Wide Web.

Those items that could not be provided were listed in a digital bibliography so the students could order items from the library using the Interlibrary Loan service or found them on Net Library in e-Book format.

Findings and Discussion

A survey was conducted at mid-term of the course and several interviews with students were conducted at various times throughout the semester. Each of these assessments revealed some interesting information. First, 50% of the students agreed or strongly agreed that the technology used in this course enhanced their ability to learn the material. The students found themselves interacting with the material and with each other more in this course than in any of their other courses. Because the lectures were online and because the technology allowed them to communicate with each other so much easier, they found themselves engaged in the course material even on days the class was not meeting.

The survey and the interviews uncovered another interesting fact. On the survey, the students were asked if they agreed or disagreed with the following statement: "If given the opportunity to take this class again, I would choose an Acts class with a more traditional lecture format." Fifty-four percent of the students agreed or strongly agreed with this statement, 20% were neutral, and 27% disagreed or strongly disagreed. However, several interviews with different students enrolled in the course revealed at least one reason why they would have chosen lecture-based course: it is easier. Every student interviewed commented that this course was very demanding, whereas lecture-based courses are not as demanding because "all you have to do is show up, memorize facts for the exam, regurgitate those answers on the exam, and that is it. There are really no assignments where we have to work, like there are in this class." Students will, however, rise to meet the expectation of a course. While there are many factors contributing to one class's grades being higher, it is still interesting to compare grades from this course and the same course taught in a lecture-based format (see Tab. 1).

	Lecture-based	Technology-enhanced
A	8 (25%)	9 (26%)
B	10 (31%)	20 (57%)
C	5 (16%)	4 (11%)
D	2 (6%)	0 (0%)
F	7 (22%)	2 (6%)

Table 1

It appears that students in the technology-enhanced, collaboration-heavy course performed better than those in the passive, lecture-based course.

Finally, it was also discovered that students enjoyed working on the assignments in teams. As one student put it, "There was still pressure to do the assignment and to do it well, but pressure on a team is a lot different than pressure one a single individual." In the beginning, there were grumblings about the way teams were chosen, but those grumblings ceased and even turned into positive results. One student remarked, "At first, I didn't like the team I had been placed on, but as the semester went on, I developed a strong relationship with my team members—I trusted them to do their best and they trusted me to do my best. When I needed help, they helped; when they needed help, I helped." Yet, as is normal, there were a couple of dysfunctional teams. Usually, the root of the dysfunction was related to external circumstances and not issues within the group.

There were also several lessons learned during this course. One lesson shows that while technology makes it easier to collaborate, students still desire face-to-face contact with the instructor and other students. Interestingly, the students enjoyed and even wanted the collaborative technology in place—and they used it. However, they also wanted a high level of face-to-face collaboration. Many of the teams worked out schedules of when they would meet online and when they would meet face-to-face. When meetings were online, usually every team member was "present" at the meeting; face-to-face meetings were not as well attended, but the quality of the meeting at the face-to-face meetings was often better than those conducted online. According to those who reported this fact thought it was due to the level of focus or distraction: there tended to be a greater focus at the face-to-face meetings and more distraction at the online meetings.

In terms of the collaborative technology provided for the students (e.g., Microsoft NetMeeting), the students tended to find their own technology for collaboration. By far the most popular was instant messenger software that the students obtained on their own. A close second, however, were the collaboration tools built into the Blackboard course management system.

Implications of this work for Oklahoma Christian University

This course provides faculty with one possible teaching model that integrates technology and pedagogy. This model is based on current pedagogical research. Moreover, the model serves as a stimulus for conversations regarding best teaching practices in classroom instruction at the college level.

The course also provides a model for teaching a course via distance education. As mentioned, the model course was designed in such a way that it could be taught in a face-to-face setting or a distance education setting.

Implications for Other Institutions

We would like to encourage other institutions of higher learning to have conversations about best pedagogical practices and how technology can facilitate learning in classroom settings.

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