INNOVATIVE USES OF TECHNOLOGY ACROSS THE CURRICULUM AT THE UNIVERSITY OF ILLINOIS

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The University of Illinois encourages and supports faculty who use innovative technologies in their teaching. This presentation highlights exemplary use of such technologies in courses as varied as Chemistry, Foreign Languages, Music and Special Education. They illustrate how multiple tools can be effectively integrated into courses taught both on campus and at a distance. The university has established a Center for Educational Technologies (CET) that supports three course management tools (CourseInfo, WebCT and Mallard), two conferencing systems (FirstClass and WebBoard), and multiple streaming media formats (RealNetworks, Windows Media and QuickTime). The courses presented highlight the effective use of these specific technologies as well as other emerging technologies, instructional methods and tools.

The professors who developed the exemplar courses provide their own personal insight (via streaming media presentations) regarding the processes involved in integrating technology into teaching and learning. They explain how their courses evolved from the early stages of adopting and integrating new technologies to their current implementations. They discuss the time and effort involved in deploying new technologies, tools they used, support they utilized, and, ultimately, the effects on student learning. Their streaming presentations are available in their entirety at the Center for Educational Technologies web site (http://www.cet.uiuc.edu) under the link In Their Own Words.

In In the Trenches, Professor Johnell Bentz describes her experiences using Blackboard's CourseInfo for the first time in a Special Education class. In Instructional Technology and the Foreign Language Curriculum, Professor Diane Musumeci discusses how Mallard quizzing, WebBoard conferencing and in-class oral communication are integral to the teaching of beginning Italian. In Using Technology To Teach Music Composition, Professor Sam Reese describes the problem of middle school teachers attempting to teach music composition to large numbers of students, and the solution of using University student mentors and the FirstClass conferencing system. In Online Education to Develop Complex Reasoning Skills in Organic Chemistry, Professor Pat Shapley discusses how she uses WebCT lectures and WebBoard conferencing to meet the needs of students with widely disparate backgrounds (many of them pursuing pre-med curricula) in a

completely online version of Organic Chemistry.

If one views these presentations, it quickly becomes apparent that the issues (both pedagogical and practical) involved in using technology in teaching can be quite idiosyncratic and specific. Course content, logistical considerations, and individual teaching styles are factors that can determine how and why particular strategies are employed. It appears that these teachers have a pedagogical content knowledge that plays a significant role in determining how they use technology in their teaching. In How People Learn - Brain, Mind, Experience, and School (National Research Council, 1999), pedagogical content knowledge is defined as "knowledge about how to teach in particular disciplines, which is different from knowledge of general teaching methods" (p. 12). In their streaming presentations, the professors in In Their Own Words offer a combination of pedagogical content knowledge and practical suggestions as they describe how they implement technology in their teaching.

In In the Trenches (the title, itself, perhaps offering a subliminal message of what it can be like when one first uses a course management tool), Johnell Bentz describes the benefits of using Blackboard's CourseInfo (a course management system) in a Special Education course. She describes the advantages of making course materials available to students anytime, anywhere, tools that enable students, instructors and colleagues to communicate and collaborate from anywhere in the world, components of CourseInfo that allow instructors to assess student progress and encourage exploration, and features of CourseInfo that promote the development of an online community (e.g., Discussion Board and Announcements). Many of the issues she encountered were practical in nature, as one might expect when first implementing new technologies.

For example, creating online quizzes can involve more than simply "putting up a few questions." Because of potential copyright issues, Bentz decided on writing entirely original questions rather than using an educational publisher's questions. Entering questions and associated correct and incorrect answers can involve a substantial amount of time, especially as one develops larger and larger pools of questions (most course management systems allow for random selection from question pools). Using online quizzes can raise issues such as whether or not the quizzes should be graded, how much of the total grade online quizzes should comprise, whether or not online quizzes should be timed, and whether or not students should be allowed multiple attempts on a quiz. Bentz ultimately decided to use online quizzes more for teaching than evaluation, and chose to make her quizzes untimed and to allow unlimited attempts on each quiz (different questions were presented to students on each attempt as questions were randomly chosen from question pools).

In contrast to Bentz's use of CourseInfo quizzes in Special Education, in Instructional Technology and the Foreign Language Curriculum, Diane Musumeci describes how the sophisticated quizzing and grading tools of Mallard (a course management system) are integral to the teaching of beginning Italian. Student

performance on Mallard quizzes is used to tailor what is presented in class. Teachers can use Mallard's visual reporting of student performance on quizzes to spend more time on what students found difficult. Mallard not only reports student grades, but also the number of attempts on each quiz (the teacher can specify how many times a student can take a Mallard quiz). The more attempts the student has on a quiz, the darker that cell (which also contains the student's grade) becomes. This enables the teacher to visually scan through the entire roster, and, indeed, the entire semester of quizzes, to determine where students are encountering particular problems. In this manner, technology is utilized to improve live classroom teaching.

Musumeci also describes how the use of WebBoard (a conferencing system) complements Mallard in beginning Italian classes. Mallard does not contain its own discussion board or conferencing system. WebBoard is employed to promote student written communication in Italian (complementing in-class oral communication). This completes a 3-part model implemented in teaching beginning Italian, which consists of web-based quizzing (in Mallard), asynchronous conferencing (written communication in WebBoard) and oral communication in class. Written communication in WebBoard promotes student to student and student to instructor communication, which contrasts with the previous practice of students keeping written journals and turning them in, periodically, to the instructor. Beginning Italian students prefer posting messages to WebBoard and reading and responding to other students' messages - they feel this has more purpose than keeping an individual journal. They learn from reading other students' Italian.

In Using Technology To Teach Music Composition, Sam Reese describes how he used a different conferencing system, FirstClass, to enable his university music composition students to mentor middle and high school students 150 miles away. When he, himself, was a middle school teacher, Reese felt that he could not provide enough feedback help to his large classes of middle school students who used computers and synthesizers to compose music. By using the World Wide Web and FirstClass, Reese now connects his university students with these middle and high school students. He describes how this benefits his university students in learning to how to give constructive feedback on other's compositions as well as the middle and high school students who receive personal attention and feedback on their compositions. The compositions are sent as attachments to messages in FirstClass, and the mentors can then see the music notation as well as play the compositions on whatever peripheral hardware (e.g., a synthesizer) they may have connected to their computers. Reese also uses a course web page to distribute the FirstClass client, itself, to students and mentors. Reese attempts to overcome the text orientation of conferencing systems by including brief introductory videos of the mentors. In fact, these simple "Meet Your Mentor" videos, linked off the course web page, end up personalizing the student/mentor relationship to a significant degree.

Reese has conducted research that has demonstrated the organizational, technical, and instructional feasibility of using this approach. The university mentors

show measurable gains in their teaching skills, especially in providing constructive feedback to the middle/high school students. Both mentors and students also find the experience enjoyable, and are highly motivated to engage in the mentor/student dialog via FirstClass. Reese does note that there can be obstacles to using such an approach. One semester, a substantial interruption in network connectivity occurred when a high school reconfigured its network. He advises patience, as there is an up front learning curve that can last a few weeks while students, mentors and public school teachers learn how to use the software and generally get used to how the entire online interactive process works. Reese also advises that such projects do not run themselves, and that he regularly monitors communications and stays in contact with the public school teachers to be sure that project activities are continuing according to plan. In the future, Reese hopes to offer this program to more students and schools, and to integrate his program with a similar one offered at Northwestern University. He also looks forward to technical improvements leading to integrated video and audio conferencing, approaching the level of face-to-face communications.

In Online Education to Develop Complex Reasoning Skills in Organic Chemistry, Pat Shapley describes how she uses WebCT (a course management system) lectures and WebBoard conferencing to meet the needs of students with widely disparate backgrounds (most of them pursuing pre-medical, pre-dental, pre-pharmacy curricula) in a completely online version of an upper level Organic Chemistry course. Even though the online version doesn't save money or time, Shapley discusses how the course promotes active learning and development of complex reasoning skills rather than rote memorization. For example, students determine how electrons move in a chemical reaction, utilize their basic chemistry knowledge to synthesize new molecules, and employ spectroscopic chemistry techniques to determine structure of molecules. Students apply their knowledge of organic chemistry to biochemical and medical problems.

The flexible format of this course includes forty WebCT lectures, which provide a summary of the day's topic and links to other resources. Each picture, word or term in a lecture is click-able and provides the student with a detailed definition or explanation. Additional background material is available for students who require it. Extensive problem solving (versus memorization) is the focus of each lecture - students do not progress until they solve problems demonstrating their understanding of material. While there are deadlines, lessons are self-pacing, the purpose of deadlines being to keep students from falling unacceptably behind. In addition to online lectures, the course home page includes a calendar listing due dates, personal grade book for each student, extra help, and short quizzes. The majority of points students receive in the course are on proctored, long-answer, written exams.

The 150 - 180 students in the course are divided into groups of about 10 each and use WebBoard to discuss and review questions they may have with their teaching assistant and with each other. They meet, online, once a week for about an

hour to solve problems that appear at the end of each lecture. Both the synchronous (chat) and asynchronous (discussion board) modes of WebBoard are utilized. WebBoard supports posting of picture files, which enables students and TAs to work on problems graphically. Shapley reports that the use of WebBoard (versus traditional "office hours") has greatly increased students' interaction with their TAs.

Shapley regularly surveys her students to find out if they are having any problems with the course material or technology. Students generally respond positively, citing the flexibility of the course and the availability of extra online materials, if they require them. While they report that they work harder, their scores on quizzes, exams, and national test are higher than those of students taking the traditional course. Shapley cites improved student performance, the students' increased interaction with TAs as well as with each other, and the flexibility of the online course as its primary advantages.

Each of these professors applies instructional technology to meet specific needs and requirements in their respective courses. Bentz gives students unlimited attempts on untimed CourseInfo quizzes, using them as teaching tools. In addition to using WebBoard to promote written communication, Musumeci uses graded Mallard quizzes to assess student knowledge, and tailor live classroom instruction accordingly. Reese uses FirstClass to create and enable personalized mentoring relationships between his university students and geographically distant middle and high school students. Shapley uses WebBoard and WebCT to create a flexible, problem-solving environment to meet the needs of students with widely differing backgrounds. According to the National Research Council (1999), these professors have specific pedagogical content knowledge. They "have a firm understanding of their respective disciplines, knowledge of the conceptual barriers that students face in learning about the discipline, and knowledge of effective strategies for working with students" (p. 176). These professors describe their particular strategies for integrating technology in teaching In Their Own Words (Sfondilias, 2000).

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In the trenches (Johnell Bentz)

Instructional technology and the foreign language curriculum (Diane Musumeci)

Using technology to teach music composition (Sam Reese)

Online education to develop complex reasoning skills in organic chemistry (Pat Shapley)

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Available: http://www.cet.uiuc.edu/intheirownwords.asp