Distance Education: Challenges, Paradigms, and Pathways for Success

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Abstract

The technology revolution in communication has reshaped and transformed our lives and professions in ways few envisioned. Today we can contact all of our students with a few clicks of the key board to send an announcement, post an assignment, alert them to an important event, or ask them to stop by our office. Students can ask questions about class material from their home, dorm room, or study group via e-mail, listservs, or bulletin boards and get an answer in a few hours without having to wait for office hours or class time. One example of the transforming power of this technology is its effect on distance education.

Article

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OVERVIEW

The technology revolution in communication has reshaped and transformed our lives and professions in ways few envisioned. Today we can contact all of our students with a few clicks of the key board to send an announcement, post an assignment, alert them to an important event, or ask them to stop by our office. Students can ask questions about class material from their home, dorm room, or study group via e-mail, listservs, or bulletin boards and get an answer in a few hours without having to wait for office hours or class time. One example of the transforming power of this technology is its effect on distance education.

The concept of distance learning is not new; in prior generations such endeavors took the form of correspondence courses, self-guided computer-based tutorials, and other combinations of technologies that circumvented the need for the instructor and student to be in each other's presence. While useful and functional for a limited set of situations, few embraced distance education and it did not flourish until recently. The emergence of electronic communication tools energized the development of distance education. Beginning in the 1980s and rapidly expanding during the 1990s, online (distance education) courses began to appear and are now fully integrated within higher education. The Department of Education estimates that more than 91 percent of public 2- and 4-year institutions offer or plan to offer distance education courses within 2 years. Private 4-year institutions are less inclined to this trend; fewer than 50 percent of these institutions currently offer some form of distance education course (http://nces.ed.gov/pubs2000/coe2000/section5/indicator53.html). From 1995 through 1998 the number of students at degree granting institutions enrolled in distance education courses rose from 754,000 to 1.6 million (http://nces.ed.gov/pubs2000/coe2000/section5/indicator53.html). The reasons for this increase include increased ease of access, institutions' desires to reach new audiences, the improved quality of online course offerings, the ability to reduce or eliminate travel and scheduling constraints, the decreased costs of computers and other electronic devices, and improved options for Internet connections (cable, DSL, satellite). One clearly positive outcome of recent developments is that higher education reaches into sectors of society that previously were excluded due to location, family obligations, and other realities of everyday human existence.

CONTENT, CONNECTIONS, AND COMMUNITY

The question of whether distance education courses deliver education of the same quality and value as traditional, on-site approaches cannot easily be answered. Both types of courses can succeed or fail depending on the facilities, teachers, students, and the goals of the course. One way to gage success is to look at how a given course deals with **C**ontent, **C**onnections, and **C**ommunity, the 3 Cs.

Content is central. While specific and general skills are important, without the framework provided by content the student may not understand or be able to develop their knowledge in the subject matter. If the primary source of course content is instructor-presented lectures, the physical space of the classroom is a requirement for student success. (Currently the broadband width necessary for streaming video is not available in most areas of the U.S.) In classes where the source of course content requires access to specific library resources, students in distance education classes are often at a disadvantage as success may be more difficult to achieve. When the primary sources for course content are textbooks, articles, and other written materials with the teacher providing guidance in their use, both distance education and traditional

education have a similar playing field. Today's commercial content materials (e.g., textbooks, CDs, websites, tutorials, animations, self-quizzes, etc.) are equally applicable to both distance and traditional courses. If the focus of the course is on emerging content, students in distance education may even have an advantage in their familiarity with the Internet and its role in making new information public in a variety of formats.

Learning is a human enterprise that involves individuals, connections, and communities. **Connections** include the student's personal connection to the material, plus his or her connections to the institution, discipline, instructor, and other members of the class. Whether the class is a traditional on-site or a distance education class, making connections between course materials and the real world has never been easier, especially for microbiology and its related subject matter, which are often in the news. The challenge is in designing appropriate learning activities that foster connections between content and meaningful or familiar components of the students' lives.

Building human connections is different in the two class types. When students and professors are thousands of miles apart it is difficult to build necessary human connections. Distance education classes need to be especially diligent in providing course components that make the student feel connected. In addition the issue of presence comes into play. "Presence" is the degree to which a student views other members of the class—including the instructor—as real (1). As odd as it may seem, communication research suggests that many students in distance education courses do not necessarily believe that other members of the course are real (2). This works to reduce the connecting that that student may feel to the course and the educational experience. A variety of means can be used to address the need for perceived presence and connections in distance education courses, e.g., chat rooms, biographic sketches, group work, etc. (see examples). Of equal importance is the necessity of establishing a routine that provides a framework and stability. New and novel situations can be engaging and enlightening, but for many students the unknown and unfamiliar are sources of anxiety that detract from learning. For learning and understanding to occur, students need to feel a certain degree of safety and comfort within the learning environment. In traditional courses, class sessions and weekly routines help to establish the feeling by building upon familiar educational pathways and routines to which students have grown accustomed. For distance education courses this need for familiarity and routine needs to be addressed by other means, e.g., assignments, modules, course layout, etc. (see examples below).

The importance and utility of **communities** within our classes is well documented for K-12 and for higher education (http://learningcommons. evergreen.edu/03_start_entry.asp for overview). Cooperative, collaborative, and group work all involve the development of learning communities where students meet in and/or out of class and work together establishing connections and communities. These exercises facilitate the ability of students to make connections with each other and provide a variety of views and contextual frameworks for the content. In distance education courses face-to-face group work is not possible. Nevertheless, it is possible to have students work in groups on an online project and thereby develop a learning community.

EXAMPLE: A SUCCESSFUL ONLINE COURSE

Like many higher education institutions, the University of Maryland in College Park has begun experimenting with distance education delivery. It currently has two graduate programs in the E-learning (http://e-learn.umd.edu) cluster wherein students can obtain an advanced degree using distance education courses. These programs build upon many years of on-campus integration of technology applications to regular classes and a well-established infrastructure that supports innovations in the use of technology to enhance learning. One of the E-Learning programs is the Master in Life Sciences Program (MLS). This program was developed for high school biology teachers and started in the Fall of 2000. It now has over 100 students from across the U.S., Canada, and overseas and is part of the National Science Teachers Association institute for professional development for teachers (http://ecommerce.nsta.org/institute/). The details of the Master in Life Sciences Program can be found at the University of Maryland E-Learning site (http://www.e-learning.umd.edu/mlfsc/). The MLS program uses WebCT (http://www.webct.com/) as the technology instructional platform.

As an example of "what works" for distance education, I will describe my experiences in teaching LFSC630, "Principles of Transmission Genetics: a Historical and Modern Perspective." LFSC630 is a 10-week online course in the MLS program. My goals in designing, developing, and delivering the course were to i) provide high school teachers a robust learning experience that would augment their content knowledge in genetics, ii) help them better integrate genetic concepts into their classes, and iii) facilitate professional development with respect to their understanding of genetics, teaching, and learning. The course was first offered in Spring 2002 to 22 students. (Courses in the MLS are limited to 20 students.) The geographic distribution of the students included 13 states in the continental U.S. plus Alaska and Canada and spanned five time zones. Only 25 percent of the students were local to Maryland with three in commuting distance to the University. More than half of the students were high school teachers; the remainder were substitute teachers [2], community college teachers [7], or were not involved in teaching [1]. Several students held Master's degrees and one individual had a Ph.D. in ecology. Students ranged in age from early 20s to late 50s, and their teaching experience ranged from none to more than 30 years. Many had families and all held a full time job. About half of the students had taken previous courses in the MLS program.

The course was organized into ten content modules, each of which focused on a specific set of genetic concepts, e. g., Mendel, meiosis, mapping, extra-chromosomal inheritance, phenotype expression, chromosome genetics, population genetics, and quantitative genetics. Modules contained the following components that were available on the class WebCT site: a description of the learning goals, notes to the student on the assigned text readings, an overview of the key concepts, and assignments (see below). Each module was available for a 10-day period starting at 6:00 a.m. Saturday and closing at 6:00 a.m. Monday, ten days later. This structure allowed students to work on the course at times that best fit their schedules. For students with families and jobs, this time was often very late at night, very early in the morning, or during the weekend. The reason for extending the module time over two weekends was to accommodate a maximum number of student schedules. The 10-module format was similar to that used in other courses in the program. The format consistency across the modules—and with other classes in the MLS program (each of which was organized in 10-module units)—imparted a sense of routine and comfort especially for students who had taken other courses in the MLS program. The course used two textbooks, a standard genetics text and a biography of Seymour Benzer by Jonathan Weiner entitled *Time, Love, Memory: a Great Biologist and His Quest for the Origins of Behavior*. The textbook was chosen because modules corresponded to chapters in the book. Except for the absence of a traditional weekly class time, the organization of the content and the amount of material was similar to that in an on-site Master's-level genetics course.

Assignments

Assignments in the course were used to build connections and community. Each module included **a set of problems that**

were due at the end of the module. The problems facilitated connections to the concepts. Generally four to six problems of various complexities were assigned and students were required to answer two of them. The problems were graded and the answers to all of the problems were posted after the module closed. To facilitate community, the correct posted answers were actual student answers. I was careful to ensure that over the course of the class everyone had one or more of their answers posted.

In addition to assigned problems there was a **discussion forum assignment each week**. The discussion forum provided the primary means by which students built connections, established presence, and developed a class community. The first discussion assignment was for each student to post his or her biographic sketch to the class. This helped me to know the class and helped the class begin to build connections. For instance, two students discovered they lived close to each other and others discovered that they had grown up in the same area. After that, for each module I posted one or two open-ended questions (see Box 1) that students answered. Each student was required to submit two posts in each module. These could be either two primary posts or a primary post and secondary post where they responded to a post by another student. Due to the large class size, students were divided into two parallel discussion groups for each module. Students were randomly assigned so that all students viewed posts from every student during the classes.

BOX 1. Examples of module discussion questions

The first key concept for the chapter states, “sex determination may be genetic or nongenetic.” In the cases where it is “nongenetic” what does this mean? Does it mean that it operates independently of the DNA information, if not then why is it considered nongenetic?

Both Benzer and Crick spent part of their science careers as physicists. Discuss whether you think this cross-pollination of scientific approaches played an instrumental role in the groundbreaking work that each did in biology. Are there fields today which we as biologists should be paying close attention to or recruiting new biologists from? Or has biology become so complex that only by very focused probing can the next great breakthroughs be achieved?

Once the module closed on Monday the discussions posts were compiled, graded (one to three checks), archived, and the summary was posted on the class site. A single module's discussion averaged 80 to 90 pages of transcript or 4 to 5 typed pages per student. However, there was a wide range in the amount and number of posts for individual students. A strong learning aspect of the discussion forum was the peer teaching that occurred and the sharing of outside resources, both of which fostered connections between the material and the students' lives. Students often traded websites and other resources that clarified a concept with which they or others might be having difficulty. Designing appropriate discussion questions that stimulated discussion and learning was always a challenge. Box 1 gives two examples.

Two other course components helped to build connections within the course. Each week I held **online office hours** where the class could convene as a group with a chat room. The weekly chats lasted for 60 to 90 minutes after which the chat transcripts were compiled and posted for those students who could not participate. One difficulty was finding a chat time that matched students' schedules across five time zones. The solution was to hold it late in the evening, e.g., 10:00 p.m. EST. The weekly online chat time worked very well with nearly half of the students participating on a regular basis. This level of interaction was much greater than what I observed for office hours in my regular on-site classes. In addition to answering questions, the weekly chat provided a forum for me to get to know the students and vice versa. In addition to scheduled chat times students e-mailed me questions or concerns, which I answered within 12 to 24 hours.

A more structured approach for building learning communities within the class was the use of **team projects**, where teams of three to four students worked together. These were called TIPs, for **T**eaching **I**nnovation **P**rojects, and are one of the common components in the MLS course set. The assignment entailed the development of an instructional module (content plus assessments) for teaching a concept to high school students. An archive of the various TIPs that students in the program have developed is made available as a teaching resource to students in the program.

Course Assessment

To assess student attitudes and perceptions we used various student surveys. These included a preliminary survey, anonymous midcourse and final course evaluations administrated by the MLS program, and an extensive exit survey. The surveys helped to build community by reinforcing that the instructor and program valued their opinions and input in improving the course. In addition, the surveys helped us to begin to understand how learning was occurring. For instance, postclass analysis of the discussion forum showed a correlation between an individual's final grade and the size and number of his/her discussion posts. Student surveys and analysis of the language and interactions in discussions indicated that interpersonal connections between students developed as the course progressed, similar to what might be seen in a traditional university class.

Putting a Finger on Why It Worked

The University of Maryland MLS program represents one approach that to date has been highly successful. It showcases some of the components that are important to consider for ensuring success in all online courses. These are:

i) the right audience, ii) good technology and support, andiii) consistent and predictable course structure.

First, the program was designed for and marketed to a specific audience: high school biology teachers. High school science teachers comprise a large audience of motivated mature individuals who have financial and professional incentives for obtaining an advanced degree. In addition there is a well-recognized need for continued professional development for science teachers, a much-publicized national crisis in K-12 science education, and a national mandate to improve K-12 education. All of the individuals in LFSC630 were highly motivated, mature, and committed to learning. Online courses whose target

audiences are 18 to 24 year olds, who hope to complete a requirement in a more convenient fashion or who are defining their career goals are less likely to be successful and may have lower rates of retention and probability of success.

A second component that has helped to make the MLS program successful is the robust technology infrastructure that supports the program. Having software, hardware, and technical support that ensure students can register, connect, and participate in the course work without problems or delay and that is available seven days a week, 24 hours a day is critical. On-site we assume that our classrooms will be unlocked, environmentally comfortable, adequately lit, and equipped with the tools needed for teaching (blackboards, chalk, projectors, etc.). If the same level of unseen support is not present for online courses, instructor and student frustration becomes destructive. Imagine what would happen if your students could not get to class because the door would not open, a similar level of frustration might occur if online students cannot connect because the University's server is down. The technology support team in our program provided hardware and software support, plus experts in online teaching and course development. These individuals provided MLS instructors with training in the use of WebCT and guidance in online curriculum design and layout of course web pages and tools.

Students have expectations regarding the format and structure of traditional courses and find comfort in consistency. Recall how your students expressed discomfort when you introduced a teaching activity that was new to them. The third key to success in the course I describe was the fact that all of the courses in the MLS program use a similar format, content organization, assessment strategy, and layout of course websites. This consistency helps students build a learning framework for the online courses and reduces anxiety. Learning frameworks are best described as the students' perceptions of the class and its expectations, e.g., whether the professor is lenient or strict, "hard" or "easy," accommodating or rigid, open-minded or intolerant, and whether the class climate is cooperative or competitive. In traditional classes we establish learning frameworks through our demeanor, lectures, and interactions with the class. In this class, the weekly discussion, assignments, chat hours, e-mail, and projects helped to build community within the class and were used to establish a class learning framework in which students constructed expectations and the rules of behavior for the class. In my class, students who had taken other courses in the program did not have the same level of anxiety as students new to the program. The presence and discourse from students who had taken other online courses in the program helped to reduce the anxiety of the new students.

More specifically, within my course the modular nature of the organization and the required discussion postings were two of the most important components contributing to course success. The modules demanded that the class move through the material together. It also facilitated peer teaching that resulted in increased individual learning and increased the community aspects of the course. In those few cases where an individual fell behind, the effect on their final course grade was significant. The individuals who received a grade of C or below were in this group. By sequentially opening modules the class material progressed in a logical fashion. This timed release of modules prevented individuals from working ahead and forgetting to focus on that week's content and learning goals.

A final component that I believe contributed to student success in the course was the use of self-reflective exercises. Students were asked at various points in the course to reflect on their learning. Exercises that required self-reflection included a short writing assignment in which they selected a genetic concept and explained what in the course helped them learn that concept. Nearly all of the students wrote that the discussion activities facilitated their learning. In addition survey questions and other assignments asked for them to reflect on their learning. Finally, a bonus question on the final exam asked students to self-assign a course grade and justify it based on their learning in the course.

CONCLUSIONS

We probably need not fear that our traditional colleges and universities will be changed into distance education universities, a niche that for-profit educational corporations such as Phoenix University (http://www.uoponline.com/default.asp) have focused on. Moreover it is unclear whether the rapid expansion of distance education initiatives in the 1990s will continue in the current economic reality. Many public institutions are facing cutbacks, and it is likely that distance education classes that are not economically viable, have low enrollments, or are perceived as unsuccessful will wither. However, distance education and interest in it are changing the way classes in higher education can be delivered and the demographic of students they can reach. Distance education represents an opportunity to extend education to new audiences and is embraced as a component of the ASM Education Board (http://www.asm.org).

Whether we believe such formats are good or bad will not change the fact that distance education is now part of higher education. Courses can be well taught or poorly taught whether they are online or on-site. While specific content and skills may be best taught in a traditional classroom or laboratory, others may be equally well or better taught online. The real question and challenge is how to use distance education as an opportunity to develop learning practices that exploit opportunities and minimize the constraints we face as institutions and educators. And then apply these practices to foster increased learning by all students and especially those who may not have access to our traditional classes.

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