Combining Technologies to Deliver Distance Education

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ABSTRACT
In 1997 a Health Resources and Services Administration (HRSA) grant was awarded to the Department of Clinical Laboratory Sciences (CLS) at The University of Texas Medical Branch - Galveston (UTMB) for support of the Laboratory Education and Advancement Project (LEAP). The project entailed three primary objectives, targeting laboratory practitioners in rural and medically underserved areas of Texas for delivering a bachelor's degree, laboratory-intensive course of study via distance education. Several delivery mechanisms were utilized and evaluated for their effectiveness and friendliness to both the faculty and students. The authors discuss and describe the mechanisms utilized for delivery of courses, the advantages and disadvantages encountered with each mechanism, and subjective evaluation of the effectiveness of the courses. Also discussed are the lessons learned and plans for future development.

Keywords
Distance education, Web-based courses, resistance, teleconferencing, CAI, discussion boards, chat rooms.

Introduction
Development of a distance education course of study would not seem to be a frightening endeavor. However, the fact is that there are many who fear (both faculty and, surprisingly, students) the technology and are suspicious, at best, of the ability to provide quality learning experiences over a distance. However, with mentoring and the ability to use some familiar technologies, fear can be replaced by more practical concepts of how to re-think and re-organize materials for presentation. The latter requires a shift in paradigms from teaching as a linear process to the non-linear paradigm of student control over access to learning resources. The University of Texas Medical Branch (UTMB) Department of Clinical Laboratory Sciences (CLS) has recently undertaken a distance learning project, encouraging and supporting this new learning paradigm among faculty, staff, and students. This project is called the Laboratory Education and Advancement Project (LEAP).

The UTMB mission is to provide scholarly teaching, innovative scientific investigation, and state-of-the-art patient care in a humane, learning environment. UTMB occupies 100 acres and 77 major buildings on its main campus, and has numerous off-campus sites in Galveston and clinic sites throughout East and coastal Texas. UTMB is committed to caring for the sick and injured regardless of their ability to pay and to educating a diverse work force of health professionals. UTMB’s eight on-site hospitals and its network of community-based clinics, plus the adjacent Shriners Burns Hospital, provide a wide range of clinical training opportunities.

The three-pronged LEAP mission is to use distance learning technologies and techniques to provide: 1) coursework to associate degree MLT/CLT (medical/clinical laboratory technician) practitioners culminating in a bachelor degree; 2) continuing education to laboratory practitioners; and 3) clinical laboratory coursework to individuals holding bachelor of science degrees in other fields but currently working in a clinical laboratory. The project specifically targets the rural and medically underserved areas of the state.
Preparing the Project Proposal

At the time that the CLS began developing the proposal to establish LEAP, an interest in and needs assessment for a bachelor degree level distance learning program targeting associate degree laboratory practitioners in rural and medically underserved areas had been previously established. The East Texas Area Health Education Consortium (ETAHEC), which has established a number of allied health profession distance education programs, proved to be a major resource in establishing the need for a distance learning program and in identifying areas of Texas that fit the criteria of being rural and medically underserved. Area Health Education Consortia (AHEC) exist throughout the U.S., funded by the federal government. The federal AHEC program is designed to link medically underserved areas or communities with health science schools in order to improve the quality of health care by increasing the number of qualified health care providers. AHECs seek to improve the quality of health care through recruitment of potential health care professionals, partnering with schools to provide the necessary initial and continuing education, and partnering with remote health care facilities to provide educational experiences for health care students. The ETAHEC serves 111 counties in the eastern half of Texas and is divided into eight community-based centers throughout those counties. The ETAHEC assists in the provision and maintenance of quality health care personnel in medically underserved areas and is involved in development of The University of Texas System Telemedicine Program. ETAHEC provided information on geographic areas that not only met the project criteria but had also already expressed interest in increased access to allied health and medical education within their area.

In preparing the project proposal, CLS faculty contacted Program Directors in Clinical Laboratory Technician (CLT) associate degree programs, hospitals and clinic laboratories, and met with prospective graduates in specific CLT Programs.

Letters of support were sought and received from CLT Program Directors and hospital/clinic administrative personnel. Almost unanimously, the responses were positive and supportive of a distance learning program. The CLT Program Directors were in agreement that this type of program would provide a career-ladder option for their students and improve their recruitment. The hospitals and clinics were supportive of such a program because of the difficulty in attracting bachelor degree CLS applicants to fill positions. The CLTs completing the proposed distance learning program would provide a ready pool of much needed clinical laboratory scientists. Rural laboratories often report the difficulty in recruiting personnel from outside of their service area. Recent studies have shown an increase in the vacancy rate (11.2%) for laboratory personnel throughout the U.S. and an even greater vacancy rate (14.6%) in hospitals with 100 or fewer beds (Castleberry and Wargelin, 1998), which is the vast majority of rural hospitals. The project plan included encouraging specific facilities to relay program information to qualifying personnel and urge them to apply.

Essentially, the basic premise underlying this approach was that if individuals are already tied to a community and can stay in that community to receive coursework, they will stay in the community after program completion. The prospective graduates were particularly pleased to learn of the possibility of attaining their bachelor's degree without leaving their local area. This is a special benefit to many students, those who are of non-traditional age, have families, and have a need to work full-time.

LEAP Implementation

The award of a federal Health Resources and Services Administration (HRSA) grant provided the funds to explore and develop the means for delivering a bachelor's degree, laboratory-intensive course of study via distance education. Recall the three-pronged LEAP mission, specifically targeted to rural and medically underserved areas, to provide: 1) coursework to associate degree MLT/CLT (medical/clinical laboratory technician) practitioners culminating in a bachelor degree; 2) continuing education to laboratory practitioners; 3) clinical laboratory coursework to individuals holding bachelor of science degrees in other fields but currently working in a clinical laboratory.

Implicit to accomplishment of this mission were needs for:

1) establishing or renewing articulation agreements with community colleges;
2) locating central sites for delivery of courses;
3) establishing appropriate linkages with specific sites,
4) recruiting students, and
5) selecting delivery methods.
Some of the necessary linkages and articulations were already in place; collaboration with the ETAHEC helped to establish additional contacts and other linkages. During the grant period, the CLS Program delivered three courses to distance students and one continuing education program.

**Technologies Used**

Courses were designed using diverse technologies, including interactive video teleconferencing (ITV), computer based course materials, computer assisted instruction (CAI), videotaping, e-mail, discussion boards, and fax machines. Each type of technology offers its own unique advantages and disadvantages. With the exception of the ITV and the computer based course materials, faculty were free to use or experiment with other technology in the delivery of courses.

**Interactive Video Teleconferencing**

Currently the backbone of the LEAP distance education courses is ITV in combination with computer-based course materials. Arrangements were made with a community college for ITV linkage at specific times each week. The students located near that community college attended lectures at the same time as on-campus students at the ITV site. Two-way linkage allowed the distance students to participate in class with the on-campus students and, likewise, for the faculty to interact with all students.

Use of ITV held two advantages: 1) face-to-face faculty-student interaction despite the distance; and 2) all students received the same lecture and additional materials such as discussions and question-answer sessions. Another non-instructional issue resolved by ITV was the ability to provide counseling for the distance students on demand. Disadvantages included:

1) the typical technological glitches and weather conditions that can disrupt communications;
2) distant students not being able to see the faculty member when slides, overheads, etc. were projected; and
3) the not-quite-synchronous voice communication.

**Web-based Instruction**

Web-based course materials supported the ITV backbone by providing supplementary materials to all students. Microsoft FrontPage© was used as the authoring tool to establish course materials on the Web. Typically, the course Web page, linked through the CLS Web page, contained the syllabus, lecture and lab schedules including topics, reading assignments, and Web links. In addition, some Web pages included lecture notes prepared using Microsoft PowerPoint©, resource Web links, supplementary materials such as charts and diagrams, procedures, images, questions and study ideas. A major advantage of this was that it made resource materials available to all students at the time of most convenience to them. This was particularly beneficial to our distance students since they were able to retrieve materials from the Web around their work schedules. If there were some type of technological glitch with ITV, the distant students still had the lecture notes and resource materials.

Another advantage to the use of FrontPage©, in particular, was that faculty were able to use Microsoft software programs with which they were already familiar. This meant that, in some cases, syllabi, lectures, objectives, and other materials that had already been developed by the instructor could be easily transferred to the Web. A disadvantage was faculty discomfort with putting course materials on the Web and the initial time investment in developing new Web-based courses. Students may be disadvantaged in acquiring these materials if they do not have easy access to a computer with internet and/or e-mail capabilities. This latter problem was countered by linking with a community college in the rural area that could provide computer access to the students. To date, however, the students who have taken our distance courses have had their own computers with internet and e-mail capabilities.

As mentioned earlier, one challenge to faculty using Web-based course materials is the paradigm change. The tools used were sufficiently flexible to allow faculty to use previously developed materials in most cases. However, as shown in Figure 1, the instructional model has traditionally been linear: lecture topic, introduction, body followed by summary information, supplemented with reading assignments.
Figure 1. Traditional linear model of instruction

Figure 2 demonstrates how faculty tend to continue using a linear model as they develop a Web course by anticipating how the student will navigate through the course materials on-line. In reality, Figure 3 may demonstrate a more realistic view of student usage as they are exposed to navigation options that permit wandering through the materials. This presents a quite different perspective of Web course design, where the faculty must anticipate the various routes a student might take in accessing resources on the Web. As courses are evaluated and updated, this should be a major consideration.

Figure 2. Typical Instructor linear model for setting up a web site
One of the courses offered also included a discussion board. Although delivery and retrieval of messages was not perfect, the discussion board provided a mechanism for presenting cases for students to discuss and ask questions. The goal was to provide an opportunity for development of problem solving and critical thinking skills as they explored and interacted in resolving the cases. There were some difficulties encountered, but most of these can be overcome with experience and better instructions to the students. One of the major difficulties involved student access and posting replies to the discussion board. Although training was provided to the students and assistance given in selecting login names and passwords, many students seemed to have difficulty in accessing the discussion board. In most cases, it seemed that the students had forgotten their login names or passwords or mistyped them and became agitated when the discussion board "wasn't working". Some students forgot how or where to post their replies and queries. Adding to the perception of this problem was the fact that the discussion board operated through the UT Telecampus rather than through the course Web pages. The UT Telecampus is an online central support system for the students, faculty and staff involved in distance education among the UT System campuses. Operation of the discussion board through the UT Telecampus added another layer of login and password entry that students had to negotiate (see the UT Telecampus at http://www.uol.com/telecampus).

Students at time found this cumbersome, particularly if attempting to participate in the discussion board from their home computers. On the other hand, some students had no problems at all and seemed to enjoy the experience. An interesting observation on the part of the faculty using the discussion board was that some students complained about having to use the computer so much as opposed to just writing out their responses.

E-mail

E-mail provided quick communication with the distance students. They were comfortable using this tool and the faculty members and students were at times capable of almost synchronous communication. This also provided a means of turning in assignments and other work. E-mail provided a major advantage for the distance students since they were often able to get much quicker replies to their queries than using the telephone since students and faculty often play "phone tag". Because the identified student population for this grant are typically of non-
traditional age and work full-time, the Web-based course materials and e-mail meant that students had access at the times most convenient to them.

Fax

A fax machine was also a particularly useful tool in offering these courses. It enabled distant students to send materials to home campus and vice versa much more quickly and allowed quick feedback.

Laboratory Courses

A special problem was presented by the Program curriculum in that most of the courses have accompanying laboratory practice requirements. The challenge was to devise mechanisms to assess and provide laboratory experiences to our distance students. This was accomplished through a variety of mechanisms, not all of which involved distance learning technology.

For the most part, the students either came to campus a couple of weekends during the semester to perform their laboratory work or the instructor took materials to the students and supervised their performance of procedures at their work sites. Some demonstrations of procedures were videotaped and included in the Web-based materials for student review and practice. If students did not have the ability to view these demonstrations via the computer, VHR videotapes were provided.

Summary

UTMB's successful pursuit of a HRSA grant provided the impetus and the funds to initiate and deliver a distance learning program of baccalaureate coursework to associate degree medical and clinical laboratory technicians in rural and underserved areas in Texas. The project has been a success on many fronts.

Use of multiple technologies addressed issues such as the necessity of maintaining high laboratory standards, the uncertainties of a devoted Web-based course of study, and faculty fears about not having eye contact with all students. These technologies were also supplemented by limited one- or two-day long activities with the distance students, mail of laboratory supplies and exercises to be completed in their own workplaces, and on-campus activities. In general, the use of multiple technologies proved to be successful in delivering course materials and maintaining appropriate contact with the target students. The freedom to use these technologies appeared to relieve some of the anxieties of the faculty in delivering their course materials and student evaluations indicated their general satisfaction with course delivery. Additionally, the distance students demonstrated their grasp of the information provided by performing well on tests and practical examinations.

While three courses were delivered during the initial grant phase, ten courses, two of which are under construction, are now available online (http://www.sahs.utmb.edu/sahs/medical_technology/cls/courses.htm). On-line courses are designated by the red check mark, which is the navigation tool to the course materials. Program faculty are now in the process of developing other courses for distance learning and evaluating and revising the courses delivered thus far. At the beginning of this project, although the grant writer had previous experience in distance education and Web-based courses, the faculty in the Program were relative novices.

This initial model will be used and expanded with the addition of at least two more distance sites. The lessons learned this past year have provided useful information for this expansion and delivery of learning opportunities. Students participating in distance education courses, of necessity, must be highly motivated and capable of self-actualization. Distance education courses place more responsibility upon the student to be active in the learning process and upon the faculty to provide meaningful learning experiences while separated from the students. The latter must, of necessity, encourage investigation of methods to encourage and facilitate the learning experience.

The success achieved using the combined technologies for course delivery has encouraged further re-thinking and re-tooling, so to speak. For example, the Program is currently investigating on-line testing and information management programs, as well as programs incorporating course development, assessment, and management. The idea of making certain materials available only by password has also been considered for security purposes.
The CLS Program will eventually develop completely Web-based courses. However, the use of multiple technologies has provided an excellent intermediary step between traditional course delivery and Web-based delivery of courses. We believe that distance education is the future of education and will be necessary to the survival of entire programs and schools in certain health professions. As Armstrong (1998) observed, the decision for using distance education in the health professions is ours, we can either lift the anchor or maintain the status quo.

References


