
Distance Learning on the Internet: Web-Based Archived Curriculum

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Abstract

Web-based education through archived educational modules offers a significant opportunity to provide didactic education. By archiving lectures and teaching materials, it reduces the educators' time of preparation, especially when many students will need to take the same curriculum over a long period of time. The site can package educational material in multiple formats including audio, video, and readable text, allowing the student to tailor the educational experience to his/her learning preferences. This can be a stand-alone program, or integrated into a program combining distance and in-person education. Assessment through on-line tests can also be conducted, but these must be considered open-book assessments where collaboration cannot be prevented. As such, this vehicle can be utilized effectively for continuing education programs in health care, where open book is permitted and credits are generally awarded on the honor system. However, tests for certificate courses should only be given with a proctor in attendance. In this instance, on-line tests can be used as pre-tests for the student, while being structured to enhance further learning.

Introduction

The United States Distance Learning Association (USDLA) defines distance learning as the delivery of education or training through electronically mediated instruction including satellite, video, audio graphic, computer, multimedia technology and other forms of learning at a distance.¹ The USDLA notes that distance education refers to teaching and learning situations in which the instructor and the learner are geographically separated and therefore rely on electronic devices and print materials of instructional delivery. Distance Education includes distance teaching – the instructor's role in the process; and distance learning – the student's role in the process. Most theorists of distance education agree on a basic definition of the field that includes four basic characteristics: (a) the teacher and learner must be separated for most of the learning process; (b) the course of program must be influenced or controlled by an organized educational institution; (c) some form of media must be used, both to overcome the physical separation of teacher and learner and to carry course content; (d) two-way com-

munication in some form must be provided between teacher and learner.^{2,3}

Modern distance learning is an extension of the early forms of distance learning with the difference that it is interactive and uses a mix of media. Earlier models such as correspondence still exist at various universities but these technologies are giving way to more modern communication tools. The most common strategies for distance learning are the use of synchronous communications such as videoteleconferencing and web-based forums such as chat rooms, or asynchronous vehicles such as a web site with archived material.

After review of these general methodologies, we will focus on web-based learning through archived material. The Telehealth Research Institute at the University of Hawaii, John A. Burns School of Medicine has experience in this arena, after helping to develop two archived, distance-learning web sites programs.

Videoteleconference (VTC) and the Internet allow a geographically distant learner to participate in a synchronous learning experience with a teacher or other students. This increases access to education for isolated patients due to geography and circumstances, and can play a role for students with physical disabilities that can limit access to the classroom. Most commonly, VTC programs are usually driven by large organizations with education as a major component of their mission. The organization places hardware at sending and receiving sites to conduct the interaction in classrooms. Connectivity is provided through closed circuit networks, or through commercial carriers. A common example is a large university campus that is linked to other campuses such as the community colleges to deliver lectures and seminars. Due to infrastructure and broadband connectivity utilized for this enterprise-wide solution, the hallmark of this model is excellent interactivity between sites, and therefore between teacher and student. It mirrors the classroom model but over a distributed campus network. The model is also cost efficient if there is enough volume of attendees at receiving sites, as it reduces the need for the number of qualified lecturers per classroom hour. As in any classroom situation, interactivity will

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decrease with an increasing number of students, but this will not be due to the quality of the interaction that is available through VTC.

VTC can also be accomplished over the Internet. The limiting step here is available bandwidth for the receiving end user, which will affect resolution and the quality of the interaction. In this instance, the receiving site usually has little infrastructure and bandwidth, so interactivity is decreased. This model is commonly used to broadcast lectures or seminars using streaming video from a large organization to students in different geographic areas. This model balances the need for interactivity from students at the receiving end in exchange for wider access to any individual having access to the Internet. As the video images are generally small when viewed on the receiving monitor, it may only be a small improvement over audio transmission.

Web-Based Learning. For individuals who are unable to attend conventional classes, Internet courses have clearly emerged as the technology of choice,⁴ with the natural evolution of the World Wide Web taking center stage. Web based learning is often called online learning or e-learning because it includes online course content. This may take two forms: live events such as discussion forums via email, VTC, and live lectures through videostreaming; archived courses that may be accomplished when desired by the end user with static pages such as downloadable course materials, and archived audio and/or video lectures. One of the values of using the web to access course materials is that web pages may contain hyperlinks to other parts of the web, thus enabling access to a vast amount of web-based information.⁵

Of these methodologies, archived web sites are emerging as a viable tool in distance learning. If properly designed, such a site can permit the student to tailor the educational experience. Visual learners may choose to scan through the slides of a presentation, and then read a transcribed document of the speakers talk. Auditory learners may prefer to listen to audio files while scrolling through the slides. Kinesthetic learners may prefer to watch the actual videotape of the person giving the talk, to better engage with the speaker. As such, if the educational content is packaged properly in multiple formats, the site could actually enhance individual learning for certain students as they can tailor the experience to their own learning preferences. This would also assist persons with auditory or visual disabilities, who could experience programs in their preferred format.

The ability to disseminate a curriculum through an archived web site is attractive for several reasons. A large organization can disseminate a core curriculum enterprise-wide, reducing the need for educators at each individual site to develop and teach the curriculum. This initial savings in time and expense can be substantial, with larger organizations having greater savings as the initial investment is leveraged for a larger audience of students. Web-based electronic media is also more readily updated and disseminated than any other type of educational media. This permits timely and rapid notification of users for important additions or changes. Common web technologies could alert providers to visit the site through an e-mail or telephone alert system.

A significant benefit of this platform is that user interactions with the site can be readily tracked and studied through standard tools and an associated database. Educators would know who is being trained, how they are training on the site, the assessment of training through

test scores, and student assessments of the educational experience. These records would not exist in such a complete format through other communication media. As the grading of test scores is done automatically, this also saves time for educators. It is necessary to recapture this and initial time savings to review this data and update the site to improve the educational experience.

In assessing students through on-line tests, due to the nature of the interaction, the test must be considered open book with students able to interact with others to obtain answers. Students may not study at all and just take the test. If the test is set up to retake until passing, then this can be done via trial and error. The site and test can be programmed to avoid some of this. Standard web-based tools can track individual's actions on the site to determine when and how long someone spent on the site prior to taking the test, as well as how many times the test was taken. This can help to ascertain if an individual is actually studying the material as desired.

Multiple tests can also be utilized for the same group of students and this could be accomplished for two reasons. The first would be to discourage cheating, if a formal type of examination program was desired beyond the open-book format currently utilized. The second would be to study whether different testing methodologies assisted with the on-line learning experience. It is postulated that by using questions where all answers are correct except for one incorrect answer, the questions will help the student review correct concepts when he/she reads the question.

Web-based learning can be the part of a total training module that includes live training. In this format, the on-line training can be conducted first, with the live training soon to follow. This maximizes the time of the trainers to give live training exercises, as opposed to giving didactic lectures. Lectures can be archived on the site, with students completing assignments before live training exercises. This combination of archived and live instruction is especially valuable for procedurally based tasks. If certification is required, then a pretest test can be given at the start of the live exercise and the final test at the end. If given at the start, those that fail are excused as they have not studied or assimilated the material yet. If students know the consequences ahead of time, they will more likely study the archived material as required.

Web-Based Programs for Health Care Providers. A growing number of professional institutions and associations have started offering modules on-line, such as continuing medical education (CME) or continuing education units (CEUs), complete with examinations that can be e-mailed or otherwise returned electronically immediately after completion. One requirement for CME is interaction with the student and the tests are utilized for this reason. CME is generally based on the honor system that the activity was completed, but the examination is considered open book.

Though many of the on-line CME modules are also available as mail-away packets, the on-line versions have an overall faster turn around time and can be instantly scored. One such organization that offers CME credits is the National Institutes of Health (NIH), who base their modules on their expert consensus statements developed for various subject areas. The NIH develops its consensus statements through conferences attended by recognized panels of experts to improve clinical consistency in controversial practice areas.⁶

Methods: Telehealth Research Institute, University of Hawaii, John A. Burns School of Medicine (UHTRI)

UH Telemedicine Project. UHTRI is a federally funded program of the John A. Burns School of Medicine. One of the main areas of focus has been the telemedicine project. Through experiences in deploying telemedicine infrastructure and programs in the State of Hawaii, an on-line curriculum was produced (<http://www.uhtelemed.hawaii.edu/curriculum/>).⁷ This curriculum was designed to help providers incorporate telemedicine techniques into daily clinical practice and is appropriate for physicians and allied health care clinicians. The curriculum consists of 10 modules including "Conducting a Telemedicine Patient Visit," "Patient Education," as well as case studies and simulations. The curriculum also has an assessment/evaluation component that enables continuous refinement. The progress of each participant can be monitored and any problems participants find with the curriculum or its website are reported to the technical and/or educational team and corrections made.

During validation of the modules with on-line tests, it was felt that 2 of 23 students may have taken the test without reviewing the material, despite repeated direct instructions that review of the material was important to the validation process. All students were warned on two occasions that their activity could be tracked on the site. The problem was identified after looking at site data for individual participants. The modules under review take approximately 6-8 hours to complete, and in both cases, all tests were completed within 2 hours of the initial log on.

Military Medical Unique Curriculum. UHTRI also supported development of the Military Medical Unique Curriculum Web Site with funding through the Pacific Telehealth and Technology Hui (HUI). The HUI is a joint DoD/VA venture that develops and provides telehealth research, services, education and training. One of us (L.B.) was the PI for the project while in the military, and remained on the project after joining UHTRI. Another UH faculty member worked (S.S.) on the project from its inception.

The Military Medical Unique Curriculum Web Site was launched with 24 complete educational modules. This was originally hosted on Hui servers, and then transferred to the Army's Medical Department after the first year. The curriculum is currently being utilized in 35 military facilities in the United States, Germany and Korea and is a mandatory training vehicle for U.S. Army interns in 10 teaching hospitals across the nation. It is available through the Army Knowledge Network, which restricts access to Army personnel only. The requirement to train interns was an Army Medical Department Initiative that was defined at the same time that funding for this proposal was identified. The curriculum was developed from subject matter experts identified by the PI and the Army Medical Department at large.

Module development included standardized assessment following the completion of the module and provided certification of continuing education for both physicians and nurses. Each module consisted of the following: abstract, digital photo of the presenter, presentation slides, audio of the presentation synced with the slides, a transcribed text document of the presentation, a test to evaluate the student, and a survey for the student to complete. The Military Medical Unique Curriculum Web Site has achieved significant success over the past few years. In the first year, more than 5700 modules were completed

by users during the first year of the site. The project had a one year return on investment of 168% and with continued operation, will conservatively save \$2.5 million in 5-years for the Department of Defense.

Discussion

Distance learning through archived material available on the Web is in its infancy. The vehicle permits wide dissemination, with excellent central control by educators and administrators. The challenge with such a site is to maintain adequate funding to continuously review and update the site. This task is not time consuming, but administrative oversight must direct the updating on a regular basis and educators must be paid for their efforts.

The ability to package the site with multiple learning methodologies is a significant advantage to this format. A full study of how people learn on such sites must be conducted to better understand the utility of these sites and how they should be constructed. Should the site utilize full video presentations, or is audio synced to a slide presentation adequate? Does the transcribed text of the talk actually detract from the other modes of instruction as audio and video, or does it enhance it? Is the selection of learning method offered to the student of benefit, or do all students only utilize one or two tools?

Assessment of students through the Internet is generally open book as discussed. This is not problematic for continuing education of health care providers as opposed to certificate granting programs. If true certification is required, then the examinations must generally be accomplished in a setting with a proctor. In this instance, the curriculum can still be provided through the Internet, but the assessment needs to be accomplished in person. Although there are multiple on-line tracking methods to verify that a certain educational module is being studied in the desired fashion, there is nothing to prevent students from collaborating with one another on a web-based examination.

The lessons learned from our validation process of the telemedicine curriculum substantiates this claim. In this case, the main issue for students was the time it took to complete the curriculum, and we desired participants to review the curriculum closely for their suggestions and input. Despite several warnings, some individuals still risked losing their stipend to save time. In a certificate granting program, one cannot underestimate the means that some might go to fraudulently receive certification, even though the majority will follow the honor system.

One possibility is to change the model to a live setting for the assessment, where the test is made available for a short time period and everyone must access and complete the test at the same time. However, a wireless network and students sitting together with lap-top computers would easily overcome this suggestion. Multiple versions of the test can be released at the same time, which makes collaboration more difficult. Even then, however, the student might have other students or professionals take the test for them. Clearly, there are methods to make collaboration more difficult, but they can all be readily overcome by students if desired.

Site utilization is an issue. The telemedicine curriculum is a valuable resource and gets some utilization from select individuals and groups, but not to the degree necessary to maintain it as a continuing medical education enterprise. It largely serves as an on-line textbook, with no specific target audience. The Military Unique Curriculum

site has been well utilized, as it was designed for a specific need and requirement. The technology transfer of the site to the Army Medical Department went smoothly, as again, the site fulfilled an important need for a continuous flow of new students requiring the same curriculum. Funding for site maintenance was readily accomplished as it was added to an extensive array of on-line activities sponsored by the Medical Department. In constructing similar sites, it is important to identify needs of partnering organizations so that the curriculum is utilized. Constructing a curriculum without specific needs will not engender the long-term success of the site.

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