

A NEXT-GENERATION DISTANCE LEARNING SYSTEM FOR PUBLIC HEALTH

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Introduction

The Interactive Media Laboratory at Dartmouth Medical School (IML), the Centers for Disease Control and Prevention (CDC), and the Association of Teachers of Preventive Medicine have entered into a three-year, collaborative agreement to explore potential uses of next-generation Internet for professional education in public health.

Computers and the Internet are pervasive elements in personal and professional life, and their influence on education and training is growing. Various initiatives, including public health,¹ have begun to tap these new methods for communicating information, ideas, and experiences. However, current efforts are typically limited to the dissemination of documents and very limited use of other media, such as lectures-on-demand using audio streaming and “slide shows” of text bullets and graphics; in a few instances, video streaming is being used, but these are either primitive experiments or more sophisticated efforts that require advanced networks or the addition of CD-ROMs to the mix.

This limitation on educational models and methods is partly due to current restrictions set by the Internet's infrastructure (lower bandwidth and inadequate user interfaces²) and partly by a lack of experience in technology-based learning among educators. The first limitation is being addressed by new private and public initiatives designed to hasten the evolution of the technological infrastructure, particularly the deployment of broadband³ networks capable of high Quality of Service (QoS)⁴; the use of user interfaces that are more intuitive (and immersive⁵); and the development of new methods for information search, retrieval and display (e.g., using "data mining" and software "agents"⁶). A common term describing the goal of these efforts is "Next-Generation Internet" (NGI)⁷. The second limitation is being addressed by efforts to give educators opportunities to use relevant technologies (notably multimedia and video streaming⁸). The project described here is, to our knowledge, the first such effort in public health.

Goals of the Project

The first goal is to help shape, to some extent, the evolution of the NGI to support the education and training of practitioners in preventive medicine and public health. The second goal is to help public health educators understand how NGI might be used when it becomes available and to prepare for that eventuality.

The first goal involves the development of tools and techniques for the production and dissemination of multimedia content via the NGI. It also involves the development of more intuitive and content-specific user interfaces than "browsers" provide.⁹ This will involve the application of NGI for public health education and training, including video streaming; CD-

ROM/network hybrid delivery of instructional content; broadband network delivery of content; immersive learning environments; automatic update of instructional software content; and use of software agents for automatic, real-time, data retrieval.

The second goal involves development, deployment, evaluation, and demonstration of exemplar programs that make use of NGI capabilities. These will employ a model for comprehensive, technology-based learning termed the Virtual Practicum,¹⁰ stemming from the reflective practicum model of Donald Schön.¹¹ The key elements of this model include opportunities for substantive interaction by the user with situations and problems presented, extensive application of high-quality motion video and other media elements, use of immersive graphic interfaces for navigation, a mentor who is both a master practitioner and master teacher, use of narrative to provide realistic and compelling contexts for learning, and employment of a variety of learning modes (problem-based learning using simulation, lectures, computer-based activities, interviews with real individuals). Two Virtual Practicum programs will be developed, one for counselors providing client-centered counseling in primary HIV prevention and another for practitioners who will be applying genetics in clinical and public health settings. In addition, more conventional learning methods will be explored, amplified for NGI-based dissemination; these will include “lectures-on-demand” and “chat” rooms with shared, “virtual white boards,”¹² to provide for combinations of synchronous and asynchronous access to lectures and group discussions. In these efforts, we will seek opportunities to work with other educators in a process of sharing ideas and experiences, tools and techniques, and end-products, with a goal of mutual education regarding application of these technologies.¹³

Innovations

From a technological innovation perspective, the project outlined is likely to accelerate the application of NGI services for public health education and training, as well as the development of technical methods for producing educational software for this environment. From an education and training perspective, the work will advance our knowledge of the application of these technologies using more effective models for professional education. Finally, the programs produced will not have to wait for the broad availability of NGI in that they will also be delivered via a combination of CD-ROM and current-generation Internet.

Future Possibilities

It is our hope that this project will help promote growth of a cadre of developers (in academia and the commercial sector) capable of producing public health educational courseware of high quality, by providing models and examples, development tools and methods, and materials that could form the basis of a training program in courseware development for NGI. We intend to explore the creation of an Institute (both “virtual” and real-world) that would help broadly to expand and disseminate the knowledge and methods of developers of technology-based, health-related education and training.

¹ CDC has been a leader with its INPHO system (visit <http://www.nlm.nih.gov/nichsr/pres/mla98/ross/index.htm> for a description. An excellent example of using current-generation Internet for Public Health education can also be found at <http://www.jhsph.edu/~distance>.

² Bandwidth is widely limited to dial-up/modem rates (say, 28.8Kbps); this is not sufficient to do much more than transfer text files and a few, smallish images, given the patience of the typical user. “Browser”-type user interfaces require some sophistication on the part of the learner, especially when searching for information and judging the accuracy, relevance and “pedigree” of the information retrieved.

³ “Broadband” refers to network bandwidth that is sufficient to carry advanced services such as “streaming” of high quality motion video (see QoS). For purposes of this project, broadband is being able to guarantee

1.5 megabits/sec. bandwidth between “client” (the user’s PC or Mac) and the “server” (the computer – or set of computers – that stores and provides an educational program and its content.)

⁴ Quality of Service is used here to describe the technical quality of media services. For purposes of our project, QoS refers to motion video of sufficient quality to support educational goals. Measures of QoS include video window size, frame rate, latencies between selecting a video stream and its actually starting, synchronization between video and audio.

⁵ By “immersive” I mean user interfaces that that conceptually and esthetically integrated with the topics about which one is learning.

⁶ Data mining refers to automated methods of deriving information from massive amounts of raw data. Agents are information processing programs that can act autonomously and can adapt to a user's needs. They are aimed at reducing “information overload” and facilitating the information-retrieval process by retrieving and displaying information according to its estimates of the user's interests and preferences.

⁷ Also the title for a highly relevant, government-sponsored initiative. See <http://www.ngi.gov/>.

⁸ “Streaming” refers to (nearly) real-time transfer and display of video or audio without requiring time-consuming downloads of inevitably enormous data files

⁹ Browsers, e.g. from Microsoft and Netscape, have so far been distributed at little or no cost to the end-user, even though they have been developed at great cost. This is done largely to promote the development of enormous new markets and lucrative models for Internet-based commerce. Despite its educational limitations, the increasing commercialization of the Internet guarantees the persistence of this model, given its clear alignment with “on demand” advertising, targetable toward buyers whose identities and tastes can be individually identified.

¹⁰ See Henderson, JV. *Comprehensive, Technology-Based Clinical Education: The “Virtual Practicum*. *Int’l J. Psychiatry in Medicine*, 1998; 28:41-79. Full text available online at <http://iml.dartmouth.edu/~joe/vpract.html>.

¹¹ See Schön DA. *Educating the Reflective Practitioner: Toward a new design for teaching and learning in the professions*. Jossey-Bass: San Francisco, 1987.

¹² An area of each user’s computer screen that is set aside to function as a white board for writing and drawing, used as part of online group discussions much as a real white board might be.

¹³ A Web-site and list-serv will be established to disseminate information and materials stemming from this project. Readers are invited to contact the author at iml@dartmouth.edu to indicate their interest in this project.