Optimizing Learning from Rich Multimedia Objects Using Micro Personal Computers: Evaluation of Educational Impact

Category
Scholarship of Teaching and Learning Grant

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Campuses and Disciplines
Worcester: Collaboration between department-based educators and Information Services

Funding Requested
$7980

Project Summary
Micro personal computers that use desktop operating systems provide increased flexibility in when and where students can choose to learn. Uses of this emerging technology in education have not been systematically studied in the medical school environment. The goal of this study is to explore how these devices may be used to benefit student learning.

For study purposes, we will use highly rated interactive brain atlases that we have previously developed to provide representative examples of rich learning objects. Initially we will use student feedback, augmented by faculty and Information Services' input, to identify the most suitable computing devices and work out ways to deliver atlas content on them both as video podcasts and as interactive PDFs (modified as necessary). We will then explore how medical students actually use these materials and devices. We will gather qualitative data from students on the educational utility of the two approaches: strengths, weaknesses, suggestions. Methods will include individual interviews (thinkalouds and stop-and-report questioning) and a written survey. Items based on Chickering and Gamson's pedagogic principles will assess characteristics

such as efficiency, ease of self-pacing, relevant interactivity and feedback. We believe that this qualitative evaluation is an appropriate starting point, and anticipate that we will be able to make both technical and pedagogic recommendations related specifically to the atlases, as well as more general recommendations about use of these devices in medical school and other areas of higher education. The data collected will be the basis of a paper on medical education.

Signatures

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Susan Billings-Gagliardi, PhD

Investigator's Department Chair: _____
Gary S. Stein, PhD

Investigator's Dean _____
Aaron Lazare, MD

Campus Provost _____
Judith K. Ockene, PhD

Project Goals and Background

The Goal of this Project is to evaluate the impact on student learning of rich multimedia learning objects that are deployed on micro personal computers. The continuing emergence of new OS-based micro personal computers (mPCs), particularly small (5-8") tablet PCs using the tablet version of Windows XP/Vista and the wide-screen video iPod using a modified Mac OSX, is making education ever more portable, and changing where and how students can access rich multimedia learning objects (materials). These devices are convenient to carry and since they run familiar desktop operating systems and applications, they are versatile. Thus they have the potential to meet individual students' learning needs in new ways. For example, using a mPC, students can view and interact with PDFs while far away from a traditional computer screen; similarly they can watch and listen to video podcasts. Such just-in-time learning is relevant to many areas in higher education, including medicine.

In short, we will identify suitable mPCs and develop sample multimedia learning objects (Brain Atlases) as interactive PDFs or video podcasts, utilizing faculty, student and IS input. Then we will compare how students use and evaluate atlases that are provided on an mPC in these two formats. These Atlases are appropriate learning objects for study: they are image-based, highly interactive, and provide an innovative approach to integration of complex medical information. In addition, we have already collected extensive, very positive evaluation data from students who used the Atlases on desktops and laptops. Finally, we believe that the strategies of guided questioning, content integration, and self-pacing that are central to the success of the Atlases can be adapted to, and perhaps enhanced by, the devices and formats that we will compare. Our questions include:

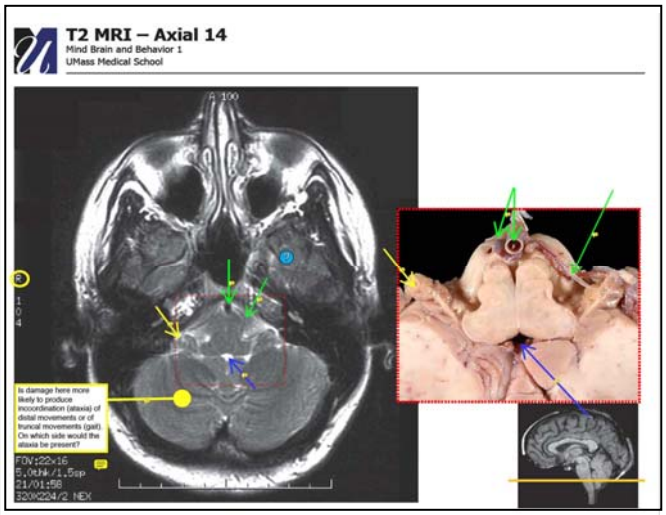
- Can faculty adapt existing rich multimedia learning objects for successful deployment on these devices? What if any revisions are necessary to maximize their usefulness to students? What level of technical and production support is required?
- Can students use multimedia learning tools installed on the most recent generation of mPC in ways that they find helpful?
- What is the student's perspective on the strengths and weaknesses of an Atlas that is available on an mPC as an interactive PDF or as a video podcast when each utilizes similar educational strategies and contains comparable content?

The answers to these and additional related questions will help faculty identify appropriate uses of these new devices that take the fullest advantage of their unique features to enhance student learning. Thematic analysis of strengths and weaknesses identified by students, as well as the experiences of faculty and technology specialists participating in this project, will allow us to develop a list of technical and pedagogic recommendations to guide faculty interested in further exploring the best uses of this new technology.

More about the Atlases: Our Test Multimedia Learning Objects

The multimedia learning objects to be used for this study are PDF-based atlases of the human brain and spinal cord, containing stained sections cut in various planes, unstained slices, and different neuroradiological imaging modalities. The images are labeled with interactive drawings and questions that direct students to key information, explain why it is important, or model integration of neuroanatomic structure and functional relationships with clinical applications.

Each student can customize their learning experience by choosing the teacher-generated materials they want to display, quizzing themselves and obtaining immediate feedback, adding their own annotations and drawings to help organize information and remember key points, and collaborating with peers. In anonymous end of course evaluations in 2006, 95% of students (n=100) gave the interactive atlases the highest possible rating as "very helpful to my learning."



The Atlases provide new ways of for students to interact with medical information, encouraging students to relate brain structure and function with clinical applications, and accommodating a wide range of learning styles.

We will select one Atlas (~ 20 images) as the rich learning object we will utilize in this study.

Project Methods

Creation of Video Podcasts Based on Atlas Content

We will test two methods for creating video podcasts from an atlas. The goal is to create technical recommendations for ways that a faculty member can create a useful video podcast reflecting the content of a learning object such as an atlas. Of special concern will be image quality, audio quality, ease of editing, and the ability to divide the content into short (~3 minute) chunks or chapters that students can directly access using image thumbnails.

- The first method is to test the portability of content captured using the recently installed Apreso Classroom capture technology. Apreso can capture and automatically output mp4 formats suitable for podcasts, although the content may require further editing for our purposes. The software listed below will be used for this purpose.
- The second method is to use desktop podcast production tools, such as Snap-Z Pro, iLife, QuicktimePro, and iStage (Mac) and Camtasia (Windows), to create and edit podcasts. We expect that this method will offer greater control of the delivered product but will take more time to produce.

Evaluation of mPCs for Delivering Multimedia Content to Students

We will test and use several devices, with a special focus on screen size and visual quality of displayed material, performance, and overall usability. Student feedback will be gathered through hands-on sessions with feedback. The goal is to define characteristics of devices that are well-suited to deliver multimedia content to students. Based on devices that are currently

available we have selected the following mPCs for evaluation: 5" Tablet (OQO Model 02), 8" Tablet (Motion Computing LS800), and a wide-screen video iPod (Apple). Based on the evidence collected, we will select a single device for the evaluation phase of the study.

Production of Sample Atlases with Similar Content in Two Formats: Interactive PDF and Video Podcast

We will develop podcast and interactive PDF sample Atlases that present the same images and information, utilize similar pedagogic methods, and can both be deployed on the mPC chosen for the evaluation phase of the study. To illustrate the video podcast, the teacher will use a digital drawing tablet to circle structures as she talks, a technique that has been used successfully in classroom settings. In developing the two sample Atlases, we will use an iterative process based on student and faculty feedback to refine and edit their content.

Comparison of Students' Use and Opinions of the 2 Sample Atlases

We will use cognitive methods such as thinkaloud interviewing and as well as direct questioning and observation to gather information about how individual students use the two sample atlases. Following Institutional Review Board guidelines, a group of 18 volunteers will be recruited from first- and second-year medical students at UMMS. We will attempt to assure that the sample includes approximately equal numbers of women and men, and represents a range of self-reported experience with technology. We will initially conduct interviews with 3 students to refine our methodology; the data they provide may be analyzed if appropriate.

Each student will be interviewed individually by the research assistant. A second observer will make notes on technical issues. Each interview will be audio recorded. Before the interview begins, the student will complete a brief written survey that provides information on his or her experience with mPC and previous use (if any) of the Interactive Brain Atlases. Students will also be given brief instruction on the use of the mPC to play video podcasts or view interactive PDFs if necessary.

Each student will then be given the first sample Atlas, and asked about how he is using it in several ways: what is he or she thinking about (commentary guided only by cognitive probes that help keep the subject talking, *"why did you do that?" "what are you thinking now?"* and specific questions that require the student to stop what he or she is doing and report *"was it useful to listen to that explanation? "Do you like the way the teacher gives feedback?"* After 15 minutes, or when the student has completed 6 atlas pages, the student will be given the second sample Atlas and the process repeated. After completing the second atlas assignment, the student will be asked to discuss his or her experience and compare the two different formats in terms of strengths, weaknesses, and recommendations. Each interview will be conducted by an individual who has no direct association with the course. Names will not be used during the taping, and students will be assured that their comments will never be identified by name to the PI. The order in which the two Atlases are provided to students will be randomized.

Examples of Areas To Be Probed By Specific Questions

- Efficiency – which format do you think would help you learn more efficiently; is one format better than the other for review?
- Ease of self-pacing – how easy for you to control the pace to meet your needs? Did you feel that information came in manageable "bites" or did you feel overwhelmed and "choked"
- Interactivity – do you think the Atlas was interactive enough? Did it help you learn?
- Integration – did the 'teacher' in the podcast or PDF help you relate basic neuroanatomy with clinical applications?
- Teacher Role – Was guidance of the 'teacher' in podcast or PDF helpful? Too much/toolittle?
- Audio – Was listening to information helpful to you? What about the quality of the sound?
- About mPC – Would you be likely to use this device (and the atlases) for learning? When and where would you be likely to use it?

Analysis

Observational accounts and audio recordings of the interviews will be reviewed. Initially one investigator (SB-G) will organize student responses to specific questions or major activities. Subsequently all authors will reach a consensus on major themes that emerge from the interview responses. Survey results will be reported by descriptive statistics. **Data gathered by this analysis, and from the previous student discussions and experiences of the investigators, will be the basis of a paper on uses of mPCs to support medical student learning.**

Dissemination of Project Results

The study results will be submitted for publication in a peer-reviewed journal, such as *Academic Medicine* (The Research in Medical Education supplement), or *Medical Education.* We also plan to present the results at the UMass Instructional Technology Conference, the AAMC Annual Conference and Educause. The results will also be presented to the UMassMed Educational Policy Committee and Schools Committee for consideration of a campus technology standard for students, and shared with faculty members and Information Services staff.

Project Budget

Hardware:	
1 5" tablet PC (OQO)	2000
1 8" tablet PC (Motion Computing)	2000
2 widescreen video iPods (Apple) available June, 2007	1000
USB microphone headset (Plantronics Audio 550 DSP - headset)	70
6x8 Intuos digital drawing tablet (Wacom)	290
Software:	
Snap-Z Pro, iLife, iWork, Quicktime Pro, iStage (Ambrosia / Apple)	200
Camtasia Studio Bundle (TechSmith)	320
Production costs for sample Atlases	900
Research assistant to conduct 18 individual interviews	590
4 lunches for 8 students (feedback on hardware & sample Atlases)	160
$25 Gift cards (compensation) for 18 students interviewed/surveyed	450
TOTAL	**$7980**

Project Timetable

Acquire Hardware/Software	June 2007
Develop Content	June - Sept 2007
Pilot and Final Interviews	Sept-Dec 2007
Data Analysis	Nov 2007-February 2008
Abstract Written	February 2008
Initial Draft of Paper	Spring 2008
Final Report	May 2008

Principal Investigator Qualifications – Education Biosketch

Susan Billings-Gagliardi Professor of Cell Biology and Neurology, UMassMedical School
Radcliffe College, BA (Biology) Harvard University, PhD (Anatomy – Medical Sciences)

Current Major Medical School Committees and Responsibilities in Medical Education
Vice Chair (Medical Education) Department of Cell Biology
Educational Policy Committee (executive committee; former vice chair)
First-Year Curriculum Committee (chair)
Educational Technology Advisory Committee (member)
Director of Mind Brain and Behavior 1 (first-year medical neuroscience course)

Awards in Medical Education
1983-2006 Outstanding Medical Educator Awards (Basic or Clinical) from 22 UMMS classes
1996 Lamar Soutter Award from UMMS faculty for excellence in medical education
1999 Alpha Omega Alpha Robert J. Glaser Distinguished Teaching Award (national award)

Projects in Medical Education using Technology
- Creation (with collaborator Ken Wolf MD) of the interactive 500-page MBB1 course book that we provide both as a PDF file on CD and in an online version through WebCT)
- Development of **StrokeSTOP** (http://www.umassmed.edu/strokestop), a web-based medical student curriculum on stroke and stroke prevention that is supported by a grant from the American Stroke Association. The **StrokeSTOP** web site has won awards for excellence, and was featured in *Syllabus* magazine and *Academic Physician and Scientist*. The educational effectiveness of the curriculum was documented in our 2001 paper in *Stroke*.
- Leader of the Brain Atlas Project – One atlas of spinal cord has been peer-reviewed and is now available through MedEdPORTAL http://www.aamc.org/mededportal, ID = 555

Publications
34 peer-reviewed papers and abstracts in Medical Education since 1995
More than 45 peer-reviewed papers and many additional presentations in Neuroscience

Additional Investigators and Key Roles

- Ralph Zottola PhD – hardware evaluation; infrastructure integration; technical observer
- Charlene Baron MEd – software solutions; technical production (imaging and podcasting); technical observer
- Kathleen Mazor EdD – development of interview protocol and qualitative analysis of data