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ABSTRACT

This document contains the following papers on new media from the SITE (Society for Information Technology & Teacher Education) 2002 conference: (1) "Virtual Reality in Education: Exploring QTVR as a Tool for Teaching and Learning" (Naglaa Ali and others); (2) "Why Not Virtual Reality?: The Barriers of Using Virtual Reality in Education" (Naglaa Ali and Richard Ferdig); (3) "Web-Based SMIL Tutorial" (Barbara Beccue and Joaquin Vila); (4) "Using Advanced Screen Capture in Support of Educational Technology Instruction" (John Bryner and Matthew Nickerson); (5) "eBooks for Education" (Terence Cavanaugh and Cathy Cavanaugh); (6) "Media Makers Produce Career Commercials: The Softer Side of Technology" (Joanne Clemente); (7) "The Internet Textbook: Change and Opportunity" (Tim Collins); (8) "Teacher Development through Curriculum Development--Teachers' Experiences in the Field-Trialling of On-Line Curriculum Materials" (Tony Fisher and Tim Denning); (9) "More than a Movie: Using Animation To Promote Learning of Complex Subject Matter" (Joseph Frantiska); (10) "Quality Metadata Scheme xQMS for an Improved Information Discovery Process for Scholar Work within the xFIND Environment" (Christian Gutl and others); (11) "Preparing for Digital Story Telling" Ellen Brinkley and others); (12) "Interactive Computer-Based Technology in EFL" (Alexandra McCormack); (13) "Adaptive Profiling Tool for Teacher Education" (Mikka Miettinen and others); (14) "Learning about Learning Objects with Learning Objects" (Sandy Mills); (15) "The Use of Internet2-Based Videoconferencing in Teacher Education" (Betul Ozkan and Clyciane Kossatz Michelini); (16) "Higher Education and the Internet 2 Project: Implications for Educational Practices" (Roberto G. Perez Galluccio); (17) "Teaching Teachers To Teach Internet Health" (Frederik Tautz); and (18) "Technology Based Learning: Myth or Reality?" (Michael Young and others). Several brief summaries of conference presentations are also included. Most papers contain references. (MES)

ED 472 239

New Media
(SITE 2002 Section)

Sara McNeil. Ed.

SECTION EDITOR:

Sara McNeil, University of Houston

Recently, I received an email called "Just a hundred years ago." In the message, the writer used historical facts and data to recount what life was like 100 years ago. It was informative and often surprising to realize that everyday products such as crossword puzzles, canned beer, and iced tea hadn't been invented in 1902. In contrast, marijuana, heroin, & morphine were all available over the counter at corner drugstores. The average life expectancy in the United States in was 47 years, and only 14 % of homes had a bathtub. Only 8 % of the homes had a telephone, and a three-minute call from Denver to New York City cost $11.00 at a time when the average wage in the US was 22 cents an hour. In the United States there were 8,000 cars, 144 miles of paved roads, and the maximum speed limit in most cities was 10 mph. The writer ended with the question, "Wonder how much it will change between now & the year 2102?"

That article was the catalyst for this introduction to the papers accepted for the New Media Section of the 2002 SITE Proceedings. I shortened the timeline to a decade since technology changes so rapidly and asked, "What was new media like when the third annual conference for SITE was held in 1992?"

1992: The Beginning of the New Media Explosion

The Internet

Although Tim Berners-Lee wrote the initial prototype for the World Wide Web in 1990, a graphical interface was just a vision in 1992. At the University of Minnesota, a team led by computer programmer Mark MaCahill released "gopher," the first point-and-click way of navigating the files of the Internet in 1991. MaCahill called it "the first Internet application my mom can use." Also in 1991 Tim Berners-Lee, working at CERN in Switzerland, posts the first computer code of the World Wide Web in a relatively innocuous newsgroup, "alt.hypertext." Many computer programmers were excited by the potential to combine words, pictures, and sounds on Web pages, and they saw the potential for publishing information on the Internet in a way that can be as easy as using a word processor. And the rumble begins....

In 1992, the term "Surfing the Internet" is coined by Jean Armour Polly http://www.netmom.com/about/surfing10.shtml, and Brendan Kehoe published *Zen and the Art of the Internet: A Beginner's Guide to the Internet* http://www.cs.indiana.edu/docproject/zen/zen-1.0_toc.html.

In 1992, the number of host computers on the Internet passed the 1 million mark, and there were about fifty World Wide Web servers. In December 2001, the number of web servers is estimated to be over 36 million. In 1993, students and staff at the University of Illinois' National Center for Supercomputing Applications created a graphical user interface for Internet navigation called NCSA Mosaic. It's not until 1994 that Jim Clark and Marc Andreesen found Netscape Communications, and the first Netscape browser becomes available.

Personal Computers

Speed has always been an issue, but in 1992, the Pentium chip was just a dream. The standard was Intel's i486 and iPSC/860. In late 1991, Apple released its first generation of PowerBooks that were an instant success. The PowerBook 145 had a CPU speed of 25 Mhz and maximum RAM of 8 MB. In contrast, the 2001 PowerBook G4 has a CPU speed of 667 Mhz with a maximum RAM of 1 GB.

Personal Digital Assistants

Although the Sharp Wizard with a small LCD screen and a tiny keyboard was developed in 1988, the term "personal digital assistant" or "PDA" was first coined by Apple CEO John Sculley who drove the development of the Apple Newton. The Newton was the first organizer to include a touchscreen and handwriting recognition software. In April 1996, a small company called Palm Computing took the idea of the Newton, shrunk it, made it more functional, and halved Newton's price to produce the first modern PDA, the Palm Pilot.

Computer Viruses

The first computer virus, known as the Brain virus, was created in 1986, and many other viruses with strange and exotic names such as *Dark Avenger* and *Frodo* followed. In 1992 the Michelangelo virus created mass hysteria; *United Press International* filed a newswire saying "hundreds of thousands of computers around the world" might fall victim to Michelangelo on March 6. But contrary to media hype, the virus did not cause significant damage. In 2002, there are over 57,000 virus definitions listed on the Symantec web site and topics such as "The Economics of Information Warfare" are posted across the Web. http://securityresponse.symantec.com/

Programming and Software Development

In 1992 Microsoft introduces Windows 3.1, and more than 1 million copies are sold within the first two months of its release. Bill Gates is the second richest man in the United States, with a net worth estimated at more than $4 billion. Word 5.0 is released in 1992 and featured a built-in grammar checker; a drawing window for simple graphics, and search-and-replace formatting.

Adobe Photoshop 1.0 was shipped in February 1990 after 10 months of development by Thomas and John Knoll. In 1993, Version 2.5.1 and the first release of a Windows version of Photoshop dazzled users. It is not until 1994 that Version 3.0 ships with the "layers" capability.

In 1992, the company, Authorware, created by one of the developers of PLATO, Dr. Michael Allen, merged with the Macromind company. The merger resulted in the formation of a new company called Macromedia. Because Macromind was already an established producer of multimedia tools, the merger helped solidify Authorware's place in the interactive multimedia market.

Video

In 1992 the first audio and video broadcasts took place over a portion of the Internet known as the "MBONE." Two years later, in 1994, the Rolling Stones broadcast the Voodoo Lounge tour over the M-Bone. The camcorder reached its voyeuristic heights on March 3, 1991, when George Holliday caught a trio of Los Angeles policemen beating a motorist named Rodney King. The resulting furor prompted police departments across the country to install video cameras in their patrol cars and consumers to start using camcorders to record civil disturbances. As the quality of the footage produced by camcorders increased, many shoe-string cable organizations started to employ camcorders instead of professional video equipment. In 1992, Sharp became the first company to build in a color LCD screen to replace the conventional viewfinder..

E-Commerce

Until 1991, corporations wishing to use the Internet face had faced a serious problem: commercial network traffic was banned from the National Science Foundation's NSFNET, the backbone of the Internet. In 1991 the NSF lifts the restriction on commercial use, clearing the way for the age of electronic commerce. In 2002, e-commerce is projected to exceed $1 trillion in the next few years.

The New Media Section of the 2002 SITE Annual

The topics of the papers accepted for the New Media section of the 2002 SITE Annual reflect these changes in the software and hardware capabilities and features, but overall they reflect the same concerns and search for innovations that were discussed in the 1992 Annual. Several papers such as the *Adaptive Profiling Tool for Teacher Education, the Web-based SMIL Tutorial,* and *Using Advanced Screen Capture in Support of Educational Technology Instruction* grapple with creating new software applications to enhance learning. Others such as *More Than a Movie: Using Animation to Promote Learning of Complex Subject Matter, MediaMakers Produce CareerCommercials: The Softer Side of Technology,* and *The Benefits of Streaming Media in E-Learning* wrestle with using new media effectively to promote learning.

If you are interested in learning more about where we've been, try

Hobbes' Internet Timeline http://www.zakon.org/robert/internet/timeline/

Goff, L. J. (October 18, 1999). Technology flashback — 1990: The way the Web was won. Computerworld Available: http://www.computerworld.com/cwi/story/0,1199,NAV47_STO37294,00.html

Digital America 2001 US. Consumer Electronic Industry http://www.ce.org/digitalamerica/history/

From Darkroom to Desktop— How Photoshop Came to Light by Derrick Story
http://www.storyphoto.com/multimedia/multimedia_photoshop.html

The worldwide Michelangelo virus scare of 1992 http://www.vmyths.com/fas/fas_inc/inc1.cfm

Towards Digital equality: The US. Government Working Group on Electronic Commerce 2nd Annual Report, 1999 http://www.ecommerce.gov/annrpt.htm

Sara McNeil is an Associate Professor in the Instructional Technology Program at the University of Houston. Email: smcneil@uh.edu

Virtual Reality in Education:Exploring QTVR as a Tool for Teaching and Learning

Naglaa Ali, University Of Florida, US
Richard Ferdig, University Of FLorida, US
Gail Ring, University Of Florida, US

One of the reasons multimedia has been so successful in education is the dual coding aspect of information processing theory (Bagui, 1998). According to this theory, humans take in information from the environment through their sense organs: the eyes, ears, taste buds and nerves in the skin. This information then goes into short-term memory and is eventually processed into long-term memory, becoming the person's knowledge base. The more senses involved in the learning process, the better the learning experiences. VR (Virtual Reality), a technology that encompasses numerous media, evokes multiple senses as opposed to more traditional methods of learning that generally involve the use of a single sense, such as sight (Rodriguez, 2001).

Researchers are now beginning to explore various learning opportunities through virtual reality. For instance, "VR in the Schools", a quarterly publication of the Virtual Reality and Educational Lab has recognized the impact and potential of VR and has begun to research new medium for incorporating VR productively into the learning process.

Others have also defined many benefits of using VR in the teaching and learning process. Follows (1999) suggested four such benefits:

- Provides the students with context for the learning process to take place.
- Allow students to control the learning process.
- Makes learning a personal experience for the student.
- Accommodate a wide range of student learning styles.

Technologists have considered the potential of using VR in the classroom, and many projects are currently exploring the educational uses of VR:

- **The Virtual Reality Skeleton Project** (Rodriguez, 2001) at http://www.lib.uiowa.edu/commons/skullvr/background.html is a computer-based tutorial to help students learn the anatomy of the human skull.
- **TerraQuest's Virtual Galapagos** at http://www.terraquest.com/galapagos allows a visitor to study the ecology, wildlife, history and geology of the Galapagos Islands.
- **Wright State University's Anatomy Department** at http://www.anatomy.wright.edu/QTVR/qtvr.html) have suggested that advantages of VR include a) allowing students to visual abstract concepts, and b) allowing students to interact with events that distance, time, and/or safety factors make unavailable.

QuickTime Virtual Reality (QTVR) is a technology that allows users to explore virtual reality. QTVR developers can create and display 360-degree views of objects or panoramic scenes that can be manipulated and navigated. With this technology, it is possible for teachers and students to share classroom projects that others can rotate and examine. It is also possible for users to look at various environments (a classroom, a different country, outer space, etc.) without the need to actually be there. QTVR software allows designers to construct three-dimensional representations of objects from two-dimensional photographs. QTVR is a wide reaching educational tool that can be used not only in a large variety of locations, but also in a large variety of situations to attain multiple educational goals.

This workshop will introduce attendees to VR, and specifically QTVR. After completing the workshop attendees will be able to:

- Explain how QTVR works.
- Produce QTVR movies (panorama and objects).
- Determine ways in which they can use QTVR at school.

Tutorial Description:

Phase I – Whole group session

In Phase I we will address the basic principles of Virtual Reality. We will discuss the hardware and software that are required to produce VR, as well as some of the design principles associated with developing virtual realities. Participants will be introduced to a number of current projects in virtual reality. During these initial phases, we will also introduce QTVR, and describe the creation of QTVR objects and panoramic scenes. Participants will be exposed to the complete process of developing QTVR products. For instance, the audience will participate in the process of planning the scene to be shot and the shooting process.

Phase II- the production process (Two participants for one computer)

Participants will have the opportunity to create their own QTVR production. The participants will be given images (to make a QTVR panoramic movie and QTVR object movie as well). The steps they will go through will include: "pre-production and planning", "production", and "post production". In this Phase, participants will:

- Familiarize themselves with the nuances of QTVR development.
- Develop a QTVR panorama.
- Develop a QTVR three-dimensional object movie.

Phase III – Whole group evaluation:

After the groups have completed their individual tasks, they will come back together to discuss the following:

- Identify ways in which VR and QTVR can be utilized in the classroom.
- Utilize applications and web sites that support VR & QTVR.
- Incorporate the many uses of VR & QTVR into their lessons.
- Evaluate the effectiveness of VR & QTVR as a learning tool.
- The participants will have the opportunity to present and share their QTVR movies.

Abstract:

Virtual Reality (VR) is an extremely useful and easy to use tool for classroom settings, because of its ability to show situations that would not otherwise be easy to imagine. This characteristic of VR enables a large variety of topics to be taught to students, who would otherwise struggle to visualize the information being presented. VR is also very useful in settings where student experience with technology is not advanced. QTVR, one example of VR, will be demonstrated. In this workshop we will give the attendees general ideas about VR and QTVR, have them brainstorm ideas about the applications of QTVR in their field. We will then have them take pictures and create QTVR movies (panorama and object). After finishing this workshop will give the attendees a survey about their perceptions of how they will incorporate QTVR movies in the teaching and learning process.

Hardware and Software for QTVR

Digital Images: Pictures for QTVR production may come from digital cameras, scanned pictures, video cameras, or Kodak PhotoCD (camera film processed on CD-ROM discs). In the workshop we will use Digital Cameras to produce the pictures needed for the producing of QTVR.

Computer: A Power Macintosh with enough RAM memory.

Software: Several choices exist currently. Most QTVR creation software is fairly easy to use. We will use VR Worx v2.0.

Tripod

References:

1. Bagui, S. (1998). Reason for Increased Learning Using multimedia. *Journal of Educational Multimedia and Hypermedia, 7*(1), 3-18.
2. Rodriguez, A. (2001). The Virtual Reality Skeleton Project. *T H E Journal, 29*(1), 64.

Why not Virtual Reality?: The Barriers of Using Virtual Reality in Education

Naglaa Ali
University of Florida
United States
naglaa@ufl.edu
Dr. Richard Ferdig
University of Florida
United States
rferdig@coe.ufl.edu

Abstract: In the near future, distance education has the potential not only to effectively deliver instruction than is done today, but also to bring people more closely together than traditional classroom education (VanderVen, 1994). Virtual Reality (VR) brings to distance education exciting possibilities that were once considered science fiction (Rigole, 1996). It has been used for years in military, government, medicine, psychology, industry, and networked entertainment programs, but it is fairly a new concept in education (Montfort, 2000). This paper explores various aspects of Virtual Reality including its definition, inception, current capabilities and future possibilities. This paper will also describe barriers of using VR in education and suggest new ways for integrating VR into teaching and learning. First, the paper will define the concept of Virtual Reality and its different types. In order to understand the implications of this technology, one must first understand the concept. Second the paper will address the benefits of using VR. I will describe what makes a good virtual environment, what prevents teachers from using this technology in their classrooms, and what recommendations exist for facilitating VR in classrooms. Finally, an example from education will be described highlightin g the use of VR in teaching and learning.

Virtual Reality (VR) can be described as a multi-sensory highly interactive computer based environment, where the user becomes an active participant in a virtually real world. Freedom of navigation and interaction are essential for a computer environment to be characterized, as a VR environment system must offer an extension of our normal experiences, thus allowing as many degrees of freedom as possible to perform a given task (Whitelock, 2000). There are many types of VR systems, which are generally classified according to the types of technology employed to implement the system. Those systems include simulators and emulators, telepresence systems, CAVE systems, fully immersive systems, augmented systems and desktop and Internet VR systems (text-based VR and graphic- based VR). Depending on the level of the user's participation and interaction with the virtual environment, VR applications are also subdivided into passive (learners have minimal control over the training event), explorative (enables students to explore and construct their own learning) or interactive environments (allows the learners to immerse themselves in the subject matter)(Whitelock, 2000). For purposes of this paper, the definition of VR is limited to the desktop and Internet graphic based VR. There are two types of desktop and Internet graphic-based VR:

1) VRML: (Virtual Reality Modeling Language) is a language for describing three-dimensional (3-D) image sequences and possible user interactions to go with them. Using VRML, you can build a sequence of visual images into Web settings with which a user can interact by viewing, moving, rotating, and otherwise interacting with an apparently 3-D scene. For example, you can view a room and use controls to move about the room, as you would experience it if you were walking through it in real space. Here are some websites that can give you more clear ideas about VRML while exploring some environments by yourself:
    - http://caad.arch.ethz.ch/~dave/heritage/world.wrl
    - http://www.finearts.art.vcu.edu/VRML/vrmlaniintro.html
2) QTVR: QuickTime Virtual Reality (QTVR) is an Apple technology that allows users to explore virtual reality. QTVR developers can create and display 360-degree views of objects or panoramic scenes that can be manipulated and navigated. With this technology, it is possible for teachers and students to share classroom projects they can rotate and examine. It is also possible for users to look at various environments (e.g. a classroom, a different country, outer space.) without the need to actually be there. Check theses website for more clear idea about the QTVR concept.
    - http://www.lib.uiowa.edu/commons/skullvr/background.html
    - http://www.terraquest.com/galapagos

Both types are important in education and serve as powerful tools for teaching and learning. Using the capabilities of VR technology allows people to expand their conceptions of the real world in ways that were previously impossible (McLellan, 1998). This power of VR technology provides several possible ways in which it can facilitate learning. It allows students to:

- Visualize abstract concepts.
- Observe events at atomic or planetary scales.
- Visit environment and interact with events that distance, time or safety factors make unavailable.
- Master, retain, and generalize new knowledge when they are actively involved in constructing that knowledge in learning by doing situation.

- Develop participatory environments and activities that can only exist as computer generated worlds (thin gs and places with altered qualities).
- Interact with a model that is as motivating or more motivating than interacting with a real thing. (Whitelock, 2000)

With all the benefits of VR technology, still there is still limited classroom use. Busy classroom teachers resist another instructional tool without appropriate provisions for training, preparation, implementation, and so forth (Auld, 1999). Teachers must understand the VR implications, and formulate a vision of where they want to go with it to enrich their own curriculum and their students' learning. School administrators must figure out the optimal application of virtual reality for each situation, while at the same time not falling into the trap of buying new technology for the sake of having new technology. Full of promise and excitement, using virtual reality in schools is a great challenge, but one that must be pursued (Sykes, 1999).

Even though teachers and administrators should learn the value of VR in classrooms, there are many reasons that limited the use of it:

- Teachers do not know how to implement the VR applications in their classrooms.
- The considerable gulf between educators and those who create the software and hardware they use.
- The cost of the VR hardware and software.
- The shortage of training workshops that train teachers how to create and use the new technologies in their classrooms.

Although these reasons limit the use of Virtual Reality in the classrooms, they are not impossible to overcome.

Creating a simple VR environment is not a hard job. To create a VR environment:

1) Teachers must know what make a good virtual environment. A good Virtual Reality environment, is the environment that can (Follows, 1999):

- Provide the learner with a reason to learn.
- Provide the learner with context for the learning process to take place.
- Allow the learner to control the learning process.
- Develop the learner's ability to solve high-level problems.
- Make learning a personal experience for the learner.
- Model the complexities and uncertainty of working in the real world.
- Accommodate a wide range of learning styles.

2) Select between the available types of VR systems that match their needs and capabilities and have a good impact in teaching and learning.

There are many ways that teachers can build a VR environment without the need of the expensive hardware and software. One of these ways is Using QTVR. QTVR software allows teachers and students to construct three-dimensional representations of objects from two-dimensional photographs. QTVR is a wide reaching educational tool that can be used not only in a large variety of locations, but also in a large variety of situations to attain multiple educational goals. Teachers can create their own VR environments that match the objectives, the curriculum, and their students' learning styles. Teachers can create these VR environments with their students. In this case the students can learn while engaging in the developing process.

One example of the development of virtual reality in education is the creation of the Educational Technology Department at University of Florida. Using QTVR, we created an online source for students, faculty, and visitors to explore the Educational Technology Department. The goal was to create an interactive web site that would allow users to view the department, and get information about it. One of the unique features of the virtual visit is the use of VR. Using a map, the user can click a VR location and explore it. We found motivation and learner interest increased using realistic, navigable VR environments. The low cost of creation and playback, as well as the broad installed user base of quick time, makes video-based QTVR technology a reasonable choice for education and training materials (Mohler, 2000).

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Web-Based SMIL Tutorial

Barbara Beccue, Ph.D.
Department of Applied Computer Science
Illinois State University
United States
bbeccue@ilstu.edu

Joaquin Vila, Ph.D.
Department of Applied Computer Science
Illinois State University
United States
javila@ilstu.edu

Abstract: This paper describes a web-based *Synchronized Multimedia Integration Language* (SMIL) Tutorial that provides an interactive online guide which uses a learning-by-example approach to teach SMIL programming. It includes thoroughly explained sample code segments and a comprehensive example that integrates many of the media components that can be synchronized using SMIL. These components are illustrated graphically and by the code.

Introduction

This paper describes a web-based Synchronized Multimedia Integration Language (SMIL) Tutorial that provides an interactive online guide for SMIL programming. SMIL is a markup language that lets you control the location, timing and sequence of still images, video, and sound for use in web-based applications. It was developed by the World Wide Web Consortium (W3C) and enables Web developers to create multimedia content for delivery over the Internet. Typical uses of SMIL include applications such as Intranet/Internet training, marketing, real estate house tours, and distance learning.

This tutorial uses a learning-by-example approach to teach the SMIL specification. All the sample code segments written in SMIL are thoroughly explained. In addition there is a comprehensive example that integrates many of the media components that can be synchronized using SMIL. These components are illustrated graphically and by the code. Although the tutorial is considered to be a SMIL tutorial it covers more than just the coding. There are major portions of the tutorial that address the issues of capturing various types of media that one can include in a SMIL presentation.

The address of the SMIL Tutorial is http://138.87.169.67/smil. This tutorial is intended to provide an easy-to-follow, step-by-step tutorial for novice SMIL programmers. The SMIL Tutorial introduces SMIL syntax and the basics of SMIL programming. Using an interactive style, this tutorial provides fully commented easy to follow examples, and programming techniques. Both linear and random navigation are provided on every page so the user can easily find topics of interest.

Contents of the Tutorial

The SMIL Tutorial consists primarily of textual content explaining the basics of SMIL programming. SMIL is based on the eXtensible Markup Language (XML) and consists of files and streams of audio, video, text, or image content. These media elements are transmitted separately over the Internet providing more economical and efficient use of resources. Yet they are presented as an apparent seamless multimedia stream to the viewer.

The SMIL specification consists of XML tags that allow the definition of windows, multimedia elements, and their synchronization in time when displayed in a SMIL capable browser. There are a variety of applications that support the SMIL specification. One of the most popular is the RealPlayer by RealNetworks, which is the default player for this tutorial. SMIL requires a number of specific file types in order to support multimedia in the RealPlayer. These file types are thoroughly addressed in the tutorial and include the following: .rm (real media), .rp (real pix), .rv (real video), .rt (real text), and .smil (synchronized multimedia integration language).

A developer must devote the time to learn the language. In order to assist interested developers, this tutorial has been structured to not only address the syntax of the language but also to discuss other development issues. Some of the topics covered in the tutorial include:

- Acquiring media resources
- Converting various media elements to streaming media.

- Learning SMIL syntax
    - Adding text to a SMIL application
    - Adding audio to a SMIL application
    - Adding video to a SMIL application
    - Exemplifying the use of SMIL tags
- Putting it all together to create a multimedia presentation

The sections about acquiring media resources discuss creating visual and sound elements. The section about visual elements covers acquiring/creating pictures, animation, video and colors. Within this framework, there is information about creating the visual elements with a still camera and scanner, a digital camera, a video camera, or graphics programs. The section about sound elements covers acquiring/recording voice and music. It addresses the process of crcating the accompanying sound elements by recording voice transcripts with a microphone and sound card, adding background music, or creating synthetic sound.

One section of the tutorial is devoted to the explanation of the process of converting traditional media files into streaming media files using Real Producer. The next section introduces/exemplifies SMIL syntax and provides numerous demos that showcase the capabilities of SMIL (See Figure 1). Finally, the major contribution of the tutorial is the section, which explains and demonstrates in detail the process of creating a SMIL application. This section presents a planning methodology, discusses the issue of bandwidth considerations, depicts the components of a SMIL application including all media resources and code, and demos the completed application.

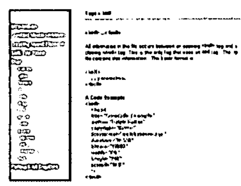

Figure 1: Tutorial Example Of The Use Of Tags

Tutorial Design

The Tutorial is partitioned into the following 6 main sections: Introduction, Creating Visual Elements, Creating Sound Elements, SMIL File Types, Tags, and Putting It All Together. As the user proceeds through the Tutorial, these 6 choices are always available on the navigation panel at the left side of the screen. With the exception of the Introduction, each section has subtopics that show on the navigation panel when the user is in that section. Additionally, there is a menu bar at the top right side of the screen that offers the user the option of seeking supporting information. Specifically, the choices are as follows: Introduction (to the tutorial), a Site Map (for the tutorial), a Search function, a Glossary, Links to related sites, and Demos that are used in the tutorial (See Figure 2).

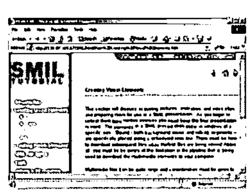

Figure 2: Interface of the Web-Based SMIL Tutorial

The final section presents a SMIL application that has been segmented into its various components. In order to provide easy access to the files and media resources, an image map has been included. This map gives the tutorial user an overview of the application components and provides an opportunity to examine each component in detail (See Figure 3). This SMIL application is also included as a demo. The user can invoke this demo on demand to visualize the synchronization of the different components (See Figure 4).

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Acknowledgments

The authors wish to acknowledge the work done by Ralph Bellas, Jr. during the implementation phase of the *SMIL Tutorial.*

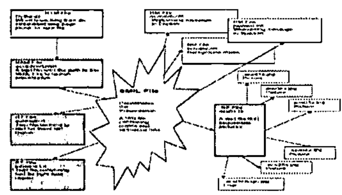

Figure 3: Components of the SMIL Application Demo

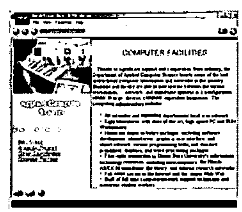

Figure 4: SMIL Application Demo

Enhancing the Classroom Through Video Technologies

A Proposal for a Video Festival Presentation

Submitted by Bob Boston

Since the invention of the motion picture, film and video have found a place in every classroom from Kindergarten to the doctoral graduate class. Most of us can remember the chatter of the 16mm projector in the back of the room, or taking a turn narrating a filmstrip. We all have memories of our favorite – and least favorite - educational presentations. Film and video have found a place as an effective tool used to supplement classroom instruction.

Today's technology offers teachers and student great versatility and creative opportunity. We can still watch pre-produced documents, but with the availability of quality and increasingly inexpensive video production tools, we can take that experience a step further. Teachers and students alike can create customized, sophisticated presentations with limited experience and funds.

This video presentation will show clips used in elementary schools, special education, and university distance education courses to demonstrate the effectiveness and advantages of using video in the classroom. This format can excite and invigorate your lessons. Watch how students involve themselves in group activities, demonstrate teamwork and problem solving as they produce their own music video or record their class plays for prosperity. See examples from our own studios of effective presentation styles and techniques used in reaching students at distant locations. All of this can be accomplished with a home video camera, computer, and a little imagination.

Educational video has taken a step into the future and it stars you, the teacher, or the student, or the principal.

Using Advanced Screen Capture in Support of Educational Technology Instruction

John Bryner, Southern Utah University, US
Matthew Nickerson, Southern Utah University, US

Abstract

Among the many burgeoning "support" applications that can enhance the technology training of preservice teachers there is new group of simple and inexpensive “advanced screen capture” programs that should not be overlooked. Also referred to as video screen capture or moving screen capture they perform a rather simple yet powerful service. Like “older” screen capture applications, video screen capture can record whatever is displayed on a computer monitor but instead of a single “screen dump” video screen capture allows the user to record the monitor’s image over time and create, as the name implies, a movie of what is happening on the screen.

There are several advanced screen capture applications currently available with a wide range of pricing. Some of the more popular applications are:

1. HyperCam, **(Windows), Hyperionics, $30.00**

2. SnagIt, **(Windows), TechSmith, $39.95**

3. SnapzPro, **(Mac), Ambrosia Software, $40.00**

4. ScreenCam, **Windows), Lotus, $86.00**

5. Camtasia, **(Windows), TechSmith, $149.95**

Southern Utah University’s educational technology program uses Apple Macintosh computers reflecting the preference of the vast majority of public schools in Utah and so we use SnapzPro from Ambrosia Software. All of the applications mentioned above are relatively simple to operate and SnapzPro is no exception.

Software

SnapzPro® can be activated with a short cut command key at any time. The short cut immediately opens the SnapzPro® window offering a choice of four capture area options: 1) the entire screen, 2) a single window, 3) preselected items, or 4) a user defined area. In addition to the area option, the user may also set the file format with the Save As option. SnapzPro® offers a range of formats including: .gif, .jpg, .pict, .png, .tiff, and .mov. All but the last option support the capture of a single image. It is the .mov option allowing the user to record all screen actions over time that we are highlighting here.

When the .mov (movie) option is selected form the Save As pull down menu the user may then define other properties peculiar to movie capture such as frame rate, scale, sound capture (internal sounds), and microphone capture (narration). Once all the setting are in place the video capture is initiated with a command key and the application begins recording the desired screen actions. A repeat of the command key halts the recording and the capture file is saved to the desktop or other selected drive/folder.

Narrative

This interactive session will demonstrate our use of this software in support of our educational technology course. At present this tool is helping in three important areas: 1) it supports faculty and lab assistants in teaching the basic software applications required for information literacy, 2) it enables teacher candidates to create powerful artifacts for their electronic portfolios, and 3) it introduces a new tool for K-12 teachers.

Educational technology faculty first used SnapzPro® in support of basic software training. There arc scvcral software applications that are covered in all sections of the course and instructors are anxious for their students to master the basics as quickly as possible so the important issues of integrating technology into teaching/learning can be discussed and practiced.. As reported throughout the country and in the literature, students are coming to college with a wide range of information literacy and computer skills. While some arrive having already mastered many productivity and Internet applications there is still a significant percent that come with considerable reluctance where computers are concerned and with few or no computer skills.
In an effort to reduce class time devoted to software basics and to support intimidated or less prepared students the faculty have created small video vignettes using SnapzPro® that demonstrate basic operations for each of the principle software applications used throughout the course. These vignettes, or video tutorials, are saved as Quicktime® movies and made available to students through the Internet via online course syllabi. Students who are struggling or who just need a simple reminder can open the video tutorial whenever they need assistance. This is especially helpful when the teacher or lab assistant is not available. The tutorials open in a small display window and can be viewed simultaneously with the application they are learning for quick and easy reference. The Quicktime® format allows students to pause, reverse or fast forward the tutorial in order to view the exact process in question and to view it as many times and at what ever speed they wish.

Reports in the literature attest to the successful use of similar video vignettes to support classroom instruction in a variety of different disciplines. Their use in training teacher candidates is proving equally successful. The ISTE standards are a prime focus of our educational technology curriculum and as candidates progress through their course of study they not only learn and practice the use of technology in the classroom, they are also mastering the tools necessary for creating and maintaining an electronic professional portfolio. SnapzPro® is proving very useful in preparing artifacts for their portfolios that demonstrate competencies described in the ISTE standards. For example, a student can create a screen capture "movie" documenting their step by step creation of a PowerPoint® presentation. Because this advanced screen capture application includes a synchronized microphone capture option, candidates can narrate the process and add important pedagogical notes and/or personal reflection to their computer demonstrations that are destined for their portfolios. Even more powerful is the use of the microphone capture to record a candidate's lecture synchronized to the presentation slides demonstrating their skills of appropriate use of presentations in the classroom.

Every hardware, software, or Internet application introduced to our candidates is taught and practiced at four levels: 1) basic functions of the application is demonstrated by the instructor, 2) candidates demonstrate basic mastery through projects that require direct application to a teaching problem or situation, 3) use of the application in the classroom is modeled by the instructor, and 4) candidates demonstrate appropriate use of the application in the classroom via individual or group projects (most often these projects reflect their emphasis or major area of study.)

Educational technology faculty at Southern Utah University are pleased with the teaching/learning outcomes resulting from our ongoing use of SnapzPro as a part of our educational technology repertoire. Online tutorials, creating portfolios and modeling new teaching strategies make advanced screen capture software a very useful tool and we encourage educational technology faculty to consider this inexpensive and easy-to-use application as part of their instructional strategy.

eBooks for Education

Terence Cavanaugh, Ph.D. Curriculum and Instruction, University of North Florida, Jacksonville, FL USA.
tcavanau@unf.edu

Cathy Cavanaugh, Ph.D. Curriculum and Instruction, University of North Florida, Jacksonville, FL USA.
ccavanau@unf.edu

Abstract: An eBook is a form of publishing in a digital medium. Because reading is a basic component of most educational activities, providing alternative formats and supports for reading activities becomes necessary to reach all students, especially special need students and distance learning classes. Digital or electronic text offers options such as Text-to-Speech that provide users additional modalities for receiving the information. New tools now allow readers to interact with the text to the extent of taking notes, marking, highlighting, drawings, bookmarks, searching, and even interacting with associated dictionaries. With modern editors eBooks can be easily created from web or word-processed documents. By creating their own eBooks and using available online libraries, instructors can expand the accessibility and ease of use both for themselves and their students.

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The ability of some eBooks to use Text-to-Speech programs offers users an additional modality for receiving the information. According to CAST (Center for Applied Special Technology), in order "to reach learners with disparate backgrounds, interests, styles, abilities, disabilities, and levels of expertise" educational materials should be flexible and adaptable for all learning styles (1998). Studies have found advantages of using electronic text technology applications with struggling readers because of the nature of electronic text over paper-based (McKenna, Reinking, Labbo, & Kieffer 1999). Anderson-Inman and Horney (1998) indicated that students benefit from the scaffolding advantages of voice output, online dictionaries, and note taking offered by electronic text to achieve success in learning. Standard print text can create a barrier for dyslexic and visually impaired students. Ebooks make information more accessible to students with disabilities. Material in digital form offers many advantages for students with or without disabilities.

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Education applications

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The future

The electronic book is by no means finished in its development. Hopefully in the future there will come a time when one content format is finally agreed upon. Currently companies are working on adding audio, video, and text-to-speech components for eBook software. Online bookstores are expanding their holdings of eBooks, with some of the college bookstore organizations including eBook forms of texts. As handheld computing devices continue to improve in their abilities and continue expand their market, it is expected that eBooks will expand with them.

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Building a Statewide K-12 Digital Library

Cellestine Cheeks, Towson University, US

A majority of academic and public libraries have formed partnerships and established some of the most dynamic networks in the history of libraries in the United States (Carver, 1999; Okerson, 1996; Uball, 1994). This major achievement has been accomplished in several states because of the concerted efforts exerted by librarians, educators, and legislators to provide equity for all students (Olsen, 2001). Colleges, universities and public libraries recognize the potential of being able to deliver access to research information to all clients upon demand (Pearlmutter, 1999; Walters, 1998). Libraries in K-12 schools should be considered essential to the success of any school, given mandated state proficiency tests in many states. Students need resources, and libraries are the places for these resources. This paper proposes to describe the process that is being used to build a strong statewide digital library collection.

The strategy used to design the planning for a statewide K-12 digital library system relied on the research conducted for college and university networks developed in the states of California, Illinois, Michigan, North Carolina and Wisconsin, and the state models involving school libraries existing in the states of Alabama, Ohio, Delaware, and Texas. The concept of defining a digital library, why it is needed as well as why a state network is necessary is presented. The role of the collection development team, technology support team, the political support, as well as the negotiations with vendors to put this project into action is detailed.

This paper presents the challenges faced by a collection development team in the process of building a statewide digital network in the K-12 community, as well as the positive impact of team collaboration to the success of the project. The goal of this project is to provide equity to all students at the K-12 level so that when they reach the college and university level they will be able to utilize digitized images, audio and video in existing network collections.

MediaMakers Produce CareerCommercials: The Softer Side of Technology

Professor Joanne Clemente
School of Education
New York Institute of Technology
Marlene Natale
Sewanhaka School District
United States
jclement@nyit.edu

Abstract: What motivates a young woman to choose a particular career path? Are glass ceilings yet shattered? How can we use the allure of television commercials to interest the next generation of young women to expand their horizons, perhaps choose careers outside their visible range? This community service project focuses on the utilization of NewMedia skills to develop career "commercials" with auxiliary web content for display at a local Children's Hospital. This project, then serves three purposes: developing young women's awareness of career choices; developing young women's technology skills to encourage higher education and career choices in Science, Engineering and Technology; to provide community service and career counseling to an underserved population at the Hospital.

Research Background:

The Commission on the Advancement of Women and Minorities in Science, Engineering and Technology Development states, "As we enter the twenty-first century, U.S. jobs are growing most rapidly in areas that require knowledge and skills stemming from a strong grasp of science, engineering, and technology. In some quarters—primarily information technology—business leaders are warning of a critical shortage in skilled American workers that is threatening their ability to compete in the global marketplace. Yet, if women, underrepresented minorities, and persons with disabilities were represented in the U.S. science, engineering, and technology (SET) workforce in parity with their percentages in the total work force population, this shortage could largely be ameliorated. Now, more than ever, the nation needs to cultivate the scientific and technical talents of all its citizens, not just those from groups that have traditionally worked in SET fields. Women, minorities, and persons with disabilities currently constitute more than two-thirds of the U.S. workforce. It is apparent that just when the U.S. economy requires more SET workers, the largest pool of potential workers continues to be isolated from SET careers." The report goes on to say, "**Active discouragement and the dearth of out-of-school SET experiences and role models contribute to girls' lack of interest in SET careers**."

The report also cites another problem, "The public image of scientists, engineers, and technology workers is often both inaccurate and derogatory. In addition, women, underrepresented minorities, and persons with disabilities are not adequately portrayed by the media as participating in SET careers." **The commission offers many recommendations, including:**

- High School: "The Commission recommends the expansion and institutionalization of successful school-based and nonschool-based enrichment programs to (a) identify—through the use of authentic, nontraditional assessments that account for the differential experiences of students—potentially able students from underrepresented groups that have been plagued by inadequate educational opportunities; and (b) enroll them in accelerated academic preparation programs. Federal, state, and local partnerships should be established to identify and fund these intervention programs at an appropriate level."
- Financial Support: The Commission recommends that the federal and state governments significantly expand financial investment in support of underrepresented groups in SET higher education

In another, more recent, source, the Report from the Council of Economic Advisors Opportunities and Gender Pay Equity in New Economy Occupations of May 11, 2000, two problems are mentioned: employment gap and pay gap. "However, an important gender employment gap exists in these IT [information technology] occupations. Women are currently underrepresented, making up only 29 percent of these occupations, compared with 47 percent of the workforce in the general economy"...There is also a gender pay gap within IT occupations. A woman with median earnings in IT earns about 22 percent less than a man with median earnings....Part of this gap stems from differences in age, education, race, and occupational composition. Taking these factors into account lowers the gap to 12 percent—a gap similar to that estimated for the labor market more generally:.... The gender pay gap narrows sharply for women in IT who have higher levels of education."

The report further states, "**Policies that assist women in their career development, such as on-the-job training and mentoring, can also enhance women's investment in these occupational skills and their retention rates, and can thus be expected to help close the gender wage gap.**"

Description of Project:

This proposal describes the collaboration between New York Institute of Technology, the Sewanhaka School District and Montefiore Childrens' Hospital. Through the collaborative efforts of undergraduate/graduate and high school girls, this project focuses on developing the skills necessary to produce non-broadcast television commercials and auxiliary web content on careers, including interviews, educational advice and expert mentors. These "CareerCommercials" and web sites will "air" at Montefiore Children's Hospital bedsides where there are installed, state-of-the-art, plasma screens at each bedside. Montefiore Children's Hospital services an underserved population. This project will address the need to encourage these young patients to pursue higher education, as well as to inform them of the many career choices currently not emphasized in minority communities. This project provides the important benefit of encouraging high school girls to pursue college educations, science and technology careers, and community service. Standards involving the integration of technology, using technology as a tool and research using technology are integral to this project. Rubrics will promote uniformity in evaluation and quality.

In their own words, the students involved in this program will virtually or physically present to the audience why they wanted to participate, what information they needed to know, and how they went about researching and presenting such information. Presenters will show documentation of their progress and report on their attitudes, skill development and career consciousness at each stage of the process. Using technology as a tool, young women seek to satisfy their own quests for information and produce a tangible result that will benefit other students, male or female as well as underserved hospitalized students. Additionally, since products are web-based, its continuous availability assures that hospitalized children, even when released, will have further access to the same content. Products from this project will be displayed and described.

Those attending this presentation will be encouraged to join this project in order to make this a national effort that reaches out to all high school students, to expand their knowledge of career choices, and in particular, encourages underserved populations to seek additional educational opportunities. While this project will initially focus on encouraging young women to acquire SET skills, any student will be encouraged to participate.

This program serves many objectives:

- High school girls will be exposed to college attendance, additional career choices and technology through their relationships with college students and professors and through their participation in this project.
- College Undergraduate/Graduate students will develop leadership as well as technology skills through their involvement in this project as mentors.
- Participants will gain experiences in the use of technology both as resource and as tool and will be better prepared for possible SET careers.
- Participants will gain professional skills and add to their "portfolio" of work, useful for future education or employment.
- The image of Science and Technology Professionals can be enhanced using the media to demonstrate Women in SET careers
- NETS standards are the guiding principles used to integrate technology into this project.
- Rubrics will guide additional participants to produce career commercial and auxiliary web content.

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Commission on the Advancement of Women and Minorities in Science, Engineering and Technology. 2000. *Land of Plenty: Diversity as America's Competitive Edge in Science, Engineering and Technology*. Washington, D.C.; National Science Foundation.

The Internet Textbook: Change and Opportunity

Tim Collins, National-Louis University, US

Abstract

Textbooks in one form or another have been a part of education since the written tradition began. Nevertheless, textbooks have changed drastically over the years in response to technology and changing needs, and textbooks will continue to change as society redefines its needs and uses new technology to better achieve those needs. The Internet now offers the potential of remaking textbooks completely. Though it is certain that the Internet will change textbooks, it is difficult to predict exactly how they will evolve. Nevertheless, it is possible to discern factors that will influence their future direction and development. This paper focuses on three major factors that will drive the development and evolution of the textbook in the twenty-first century: (1) the scarcity model for publishing and information technology, which was the foundation of traditional print publishing and current copyright law, is no longer appropriate for Internet publishing; (2) interactive, Internet-delivered textbooks will truly honor multiple forms of discourse, in many cases forms of discourse that are not currently validated by the academy; and (3) the multiplicity of skills and content expertise required to create these textbooks will cause the roles and functions of author, editor, and so on to change.

In the words of Yoggi Berra, "Making predictions is hard, especially when they're about the future." This statement is especially true of the impact of technology on our lives. Though it is virtually certain that technology will change our lives, the outcomes are not yet clear. Hundreds of innovations, such as widely available hand-helds, new kinds of wireless connectivity, universal Internet access, and wide access to broadband connectivity, have the potential of transforming our lives in ways that many of us never imagined even a few years ago.

This paper focuses on the impact of technology on one key artifact of the educational system: the textbook. Textbooks in one form or another have been a part of education since the written tradition began. Nevertheless, textbooks have changed drastically over the years in response to technology and changing needs, and textbooks will continue to change as society redefines its needs and uses new technology to help better achieve those goals.

The comprehensive textbook, with illustrations, ancillaries (such as workbooks, study guides, audio programs, flash cards, manipulables), and teacher's editions, is a relatively modern invention. The earliest textbooks were probably scripture, since in most societies, scripture was the most universally accessible, if not the only accessible written text. Many subsequent early textbooks incorporated selections from scripture in them, too, since one of the most culturally important reasons for becoming literate was in order to be able to read scripture. The first graded, or multi-level, textbooks, such as the McGuffy's Readers series, emerged in response to universal public education, when industrial models began to be applied to mass education and children were expected to enter school at a certain age and progress though grades of instruction on an annual basis until they finished. The first comprehensive teacher's editions, which gave teachers detailed instructions on how to work through each page with students, were developed in the early 20th century by the first publishing company to focus exclusively on the educational market, Scott, Foresman and Company. This company's series of readers, including the Dick and Jane series, were the first true basal reading series with comprehensive teacher's editions published in the United States. This company's products set the standard for basal textbook publishing in all disciplines and were imitated by a host of competitors. In college textbook publishing, a similar series of developments took place, as companies developed textbooks for the major college courses and progressively added ancillaries for competitive reasons.

Technology played key steps in each stage of the development of the textbook. As printing and typesetting technology improved, companies found that they could produce books with added features such as full color illustrations. Development of sound recording made possible recorded audio programs, key ancillaries for foreign language and music series. Faster and cheaper ways of setting type (such as the demise of hot metal and its replacement with cold type and later with electronic typesetting and page composition) also dramatically lowered costs and time to market, which allowed for shorter production times and more up-to-date content. Companies also began introducing software supplements, such as test generators, computer simulations, drill-and-practice software for math, reading, and language arts, and even Internet sites.

Now the Internet has the potential of allowing us to remake textbooks completely. It is difficult to predict how textbooks will evolve, but it is possible to discern some of the factors that will influence their development. Three major trends will drive the development of the textbook in the twenty-first century.

1. The scarcity model for publishing and information technology will no longer be appropriate.
2. Textbooks will truly honor multiple forms of discourse.
3. The multiplicity of skills and content expertise required to create books will cause the roles and functions of author, editor, and so on to change.

First, traditional publishing has been based upon an information scarcity model that is not appropriate to Internet publishing. Copyright laws essentially grant a monopoly to the owners of intellectual property that allows them to charge as much as the market can bear for their products. This has ultimately created a vicious cycle in which, at least in the college market, price increases drive increases in used book sales, which drive further price increases and faster revision cycles, which in turn drive additional used book sales. In fact, statistics from the Association of American Publishers indicate that nowadays many students are failing to buy a book at all because of cost. Most other students keep their books only through the duration of the course and then sell them back to the bookstore, a sad statement of the value proposition college textbooks provide. In elementary and high school publishing, high prices drive many less affluent school districts to put off new book purchases for as long as possible, leading in some cases to situations such as one that happened a number of years ago in Texas, in which textbooks then in use indicated that the Soviet Union was still in existence, when in fact it had been dissolved for several years.

Clearly this is not a very desirable situation: as the price of information increases it becomes less valuable to acquire. An information abundance model, therefore, would provide more acceptable results: as information becomes more accessible its value increases. Take, for example, the case of on-line journal indexes with full-text access. The ease of use, including access from any computer anywhere, makes it much more likely students will use periodical resources in electronic formats than if they were to use paper copies of indexes such as the *Reader's Guide* and then go to the stacks to find paper copies of the articles or, in the case of the library at one school I attended, wait for a page to retrieve the requested volumes from the stacks. Other advantages are savings in library bindings of periodicals, costs for shelving and retrieving copies, costs associated with keeping track of checked out books, and so on. Clearly, in this example, everyone wins: access to information is cheaper and easier, which motivates people to use periodical resources more than they would have than in the past, and allows libraries to use their limited resources to acquire more materials. By applying the economies and speed to market offered by online delivery of textbooks, prices would go down. Students and school districts would be more motivated to buy them, professors would be able to assign additional books because the total bill would be more manageable, and students would be less motivated to buy used books because new books could be updated each semester or year. In this situation, everyone wins.

Second, technology will motivate textbooks, and the academy, to honor multiple forms of discourse. In the past, the bellwether of a serious academic text was page after page of dense type, broken up, if at all, only by graphs, tables, and charts. One of America's most respected serious literary magazines, *The New Yorker,* did not publish illustrative art in its articles at all until well into the 1990s. Textbooks nowadays have copious illustrations, but technology will enable many different forms of discourse to be added to textbooks, from sound files (such as quotations from historical figures in history and political science texts and speech samples in linguistics books), to streamed media, to animated illustrations. Imagine, for instance, how wonderful it would be if a biography of Shakespeare allowed us to see and hear actors performing, take a virtual walk through a multidimensional Elizabethan theater, hear Elizabethan music, and see films of places Shakespeare probably saw. The advantages of this type of learning tool over a two-dimensional, static printed page are multiple, and to the benefit of everyone.

Finally, technological change will cause the traditional tasks and roles of educational publishing to change. Already, the changing economy has caused similar changes in other sectors of the workforce. Doctors, for example, no longer make all decisions about managing patients' health care. Health maintenance organizations and insurers have taken over much of this responsibility. The functions of author, editor, and book designer will be redistributed, and new roles will be added such as that of instructional designer. The author will be less the architect of the pedagogy and more a content-matter expert, and the instructional designer will help the author tailor the delivery of the content to the technological resources available. The editor will deal with not only words and pictures, but also have to manage the creation of multimedia. The role of editor will become more akin to multimedia project manager and less a shaper of words, and the content editing may in fact be delegated to another person in charge just of this one small aspect of something has become a much larger process. Clearly, this change implies that roles and responsibilities will be debundled and rebundled, and individuals working in textbook publishing will have to brace themselves for considerable upheaval.

Ultimately, this change will also affect the very notion of authorship. The trope of single author-single text arose during the Romantic period, and is a notion that will diminish in importance as the collaborative, team-based approach necessitated by technology takes hold. There will be more "managed books," and publishers may need to find new ways to acknowledge all of the different collaborators in a publishing project.

Technology, then, promises to change textbook publishing in a number of key ways. First, it will obviate the scarcity model on which publishing had been traditionally based, and replace it with a model in which the value of information increases as it becomes more accessible. Second, technology will result in the creation and validation of multiple forms of discourse that will enrich the educational experience. Third, because of the variety of skills and expertise needed to build interactive textbooks, the notion of authorship will change and more collaborative development models will become the norm. The net result will be as fundamental a change to the production and notion of the textbook as the changes caused by the development of moveable type.

Teacher development through curriculum development – teachers' experiences in the field-trialling of on-line curriculum materials

Tony Fisher University of Nottingham School of Education, England tony.fisher@nottingham.ac.uk
Tim Denning Keele University School of Education, Keele, England t.j.denning@educ.keele.ac.uk

Abstract : This paper reports on the experiences of teachers participating in the field trials of new on-line curriculum materials and associated technologies in the UK. During the period January to July 2001, teachers in 60 secondary schools in England participated in the trialling of on-line curriculum materials in Mathematics, Japanese and Latin. The three subject projects differed in a number of respects, but overall the teacher res ponse was extremely positive and revealed a number of consistent trends relating to aspects of teacher development that ran across the differing subject settings.

Background

Since the early 1970's a sequence of government initiatives can be identified, with the underlying aim of increasing the use made of computers in schools in the UK (see for instance Watson, 1997, for a summary). More recently we have seen the planning and development of the Inernet-supported 'National Grid for Learning' (NGfL) as part of a wider strategy which also includes training for new and serving teachers, and requirements for the use of information and communications technology (ICT) within the statutory framework of the National Curriculum. Of course, though aspects of the strategy are particular to the UK, the underlying purpose has also been recognised and is being addressed elsewhere.

"The aim of many policy-makers in the UK and around the world is to encourage evolution into a learning society... one in which all people are responsible for their own learning throughout their lives. Access to information and learning will often depend on new technologies as well as on an approach to teaching which supports collaborative professional development.

Governments in Europe and around the world have already recognised the need to review educational practices and incorporate new technologies. Their view is of a vocational imperative and one in which IT will increase the quality and efficiency of learning itself." (Somekh et al, 1997)

Part of the NGfL strategy is to ensure that all secondary schools will have a high bandwidth Internet connection. This, together with internal networking in schools, will enable the use of Internet-delivered digital curriculum materials for learning and teaching within subject classrooms. It is within this developing context that the project reported here took place.

The KS3 Subjects Online Project

In 2000 the Government's Department for Education and Employment (DfEE) invited tenders for the development of technology-based subject courses for a year's worth of study in three subjects: mathematics, Latin and Japanese. The project sought to stimulate the development of "state of the art computer based programmes for teaching numeracy, classics and non-traditional languages; exploiting the full creative multimedia interactive potential of these technologies".

Three developers with experience in writing multimedia curriculum materials were contracted to develop materials in the three subjects and to set up field trials for the materials. The developers were under a contractual requirement to produce materials that met a number of criteria relating to technical and other aspects. Among these were that the materials should be sufficient for a year's worth of study and should be targeted at Year 7; further, the materials should be capable of both mediated and unmediated use by learners. A further requirement on the developers was that they should set up the use of the materials in twenty schools per subject, together with use by 'independent learners' working in unmediated contexts, so that the use of the materials could be evaluated in a variety of contexts. In the case of mediated use in schools, which is our focus in this paper, teacher-mediators might or might not have a specialism in the subject in question.

The three individual subject projects used differing approaches to the development, dissemination and support of their particular materials. In the case of Japanese, the materials were designed wholly for on-line delivery by means of existing technical resources and used a variety of animated cartoon characters and high quality audio to engage students in an 'immersive' approach to language development. This was complemented by on-line assessment activities. The materials required no particular input or mediating activity on the part of a teacher.

The mathematics materials were designed for delivery within an on-line 'managed service' framework, using dedicated hardware and an interactive whiteboard to support a wide variety of software-based learning activities. These were used to support whole class teaching designed to conform with the Key Stage 3 National Strategy for the development of numeracy, complemented by an on-line planning tool and mark book for teacher use, and student access to 'Sub Patrol', a Web area of mathematics activities and games. With the exception of the latter, a high level of teacher mediation was built into the approach adopted for mathematics.

The Latin project employed CD ROM technology to deliver local 'media rich' content and learning activities, including a large amount of video material, linked to on-line facilities for the management of content by the local teacher. There was also provision for electronic submission of written work to and from a designated 'e-tutor'.

The three subject projects also differed in their approach to training and support for the teachers involved in the school-based trials. In the case of the mathematics project, there were regular face-to-face training sessions for the whole group of project teachers, on-line community building and support, a help desk and regular school visits by the developers. In the case of Latin, there were two training events, technical support and visits to schools, in addition to on-line e-tutor support. In the case of Japanese, there was a launch event, regular electronic newsletters, a telephone help-desk and school visits.

Methodology and Data

The external evaluation employed an eclectic methodology including qualitative and quantitative aspects. Throughout the evaluation there was contact between the evaluators and the developers, with the evaluators providing formative feedback for later development cycles. There was also contact between the external evaluators and the internal evaluation being undertaken in each project. In addition, the evaluators were in regular dialogue with the project managers at British Educational Communications and Technology Agency (Becta), and with a project management group including representatives from the DfEE. The evaluation drew upon Robert Stake's responsive evaluation model (Stake, 1979), which makes use of a variety of methodologies as negotiated through and informed by discussion with key participants during the life of the project.

The research design made use of triangulation procedures, involving classroom observation of the materials in use by teachers and students, teacher interviews and postal questionnaires, and student interviews and questionnaires. Interviews followed a 'semi-structured' approach, and were recorded on digital mini-disk. Additional data about the background to the use of the materials, and responses to the materials themselves, were gathered by postal questionnaires completed by teachers and students. Information about the schools themselves was provided by the developers.

Interview data were collected from 44 separate school visits undertaken by the evaluators. These incorporated more than 60 staff interviews and group discussions with more than 250 students. Survey responses were received from 534 students and included nearly 500 individual comments about the resources. The main teacher questionnaire was completed by 43 teachers whilst the end of project survey was completed by 26. An established subject specialist also reviewed each of the subject resources.

The field recordings of interviews with teachers and students were subjected to content analysis. The questionnaires were subjected to quantitative analysis, supplemented by qualitative analysis of comments made in response to open questions. A final report covering the contracted evaluation aspects was produced and submitted to Becta for the DfEE.

During the field visits to schools for data collection, and through their contact with teachers, the evaluators became interested in the impact of the experience on the professional development of the teachers involved in the trials. Although this was not a major component of the contracted evaluation, it is upon this aspect of the project that we focus here.

Three illustrative 'vignettes'

Aspects of teachers' experience are illustrated by the following three vignettes, one from each of the three subjects, drawn from observations conducted during school visits. Though none is in a strict sense 'typical', these vignettes have been chosen to give an impression of the impact of involvement in the projects on the teachers involved. In each case the teacher is referred to by an alias.

Vignette 1
Drew has three years' experience as a teacher of mathematics. He had not used an interactive whiteboard before becoming involved in the project, but had used powerful computers in a previous career. In the observed lesson he made extensive use of the interactive whiteboard (the only one in the school) both for direct teaching and for students to demonstrate their work. He set up a number of separate activities involving the use of three desktop workstations and a set of programmable graphical calculators. He commented that he had to invest a lot of time in preparation initially, as he was familiarising himself with the activities and the use of the technology, but he has become faster as he has become more familiar with the approach. He and his Head of Department are negotiating with the school for the purchase of another interactive whiteboard, as their evaluation of its impact as a tool to support teaching and learning in mathematics is so positive. He will train his colleagues in the mathematics department in technical and pedagogical aspects of its use. Other departments are also showing an interest.

Vignette 2
Kathy has been teaching English for five years. She describes herself as having been rather resistant to the use of new technologies before becoming involved in the Latin project. She has become a much more confident user of the technology. Kathy had to develop a productive working relationship with the school's ICT technical support in order to receive assistance and advice regarding local technical issues. As a trained English teacher Kathy has also had regular e-mail contact with a project 'e-tutor' who as a Latin specialist advises her on aspects of supporting learning in Latin. Kathy did not wish merely to supervise computer-based activity; rather, she saw her role as facilitator in terms of adding value pedagogically. She puts in a lot of preparation time at home on a portable computer provided by the project. Latin lessons with a volunteer group of students take place weekly after the end of the normal school day in a purpose-built computer room. In the observed session Kathy introduced the lesson and directed the students to relevant parts of the materials. Students then accessed a revision activity from among the materials which had been placed on the school's curriculum network server. Kathy concluded the lesson with a group debrief during which she used a data projector.

Vignette 3
Susie has five years experience as a teacher of Japanese. The observed lesson was a timetabled lesson in a school where Japanese is an established subject. Susie had tried to use the on-line materials with her whole class of 28 students, but the school's Internet connection was not of sufficient bandwidth for that number of simultaneous accesses to the materials, and download times became unacceptably slow. Susie had therefore developed an approach in which, after a whole class introduction to the lesson, she divided the group into two halves. Half stayed in the normal classroom undertaking teacher-initiated activities, whilst half went to a nearby computer room to use the on-line materials. Susie supervised activity in both locations, moving back and forth between the two. At the mid point of the lesson the two half-groups changed over, and the lesson concluded with all students in the computer room where Susie made use of an installed data projector to conduct a plenary session involving an adapted use of part of the on-line materials.

Results

In general the project increased the participating teachers' use of new technologies, as illustrated by the vignettes. Previous use varied from a very low base in some cases, including no previous use in the teaching situation at all in the case of some teachers. This was as a result of one or both of two factors: a lack of pedagogical confidence in the use of new technologies in the teaching and learning situation, and a lack of ready access to the necessary technological resources for the subject concerned. In other cases individual participating teachers reported a relatively high base of pre-existing use of new technologies in the teaching situation. However, in each subject all teachers said that their teaching had benefited from the use of new technologies employed by the three subject courses, and most felt that their students are motivated by the use of computers.

In terms of the development of participating teachers, several trends may be discerned. All put in additional time for planning and preparation, as they became familiar with new materials and approaches. They were given no release from other commitments in order to support day-to-day participation, so the additional time was above and beyond a full teaching load. *"I've found it hard work this year and you have to put a lot of time aside for it... I wouldn't have taken it up if I didn't think it was worth it."* (Maths teacher, interview)

In some cases teachers were supervising the project lessons outside normal timetabled lesson time, as this was the only time that access to the necessary computers could be arranged. This was not so in mathematics, where a dedicated, specially equipped project classroom was set up. However, in the case of the Latin and Japanese projects, many teachers found themselves competing for access to the necessary technologies. For instance, *"The Languages Department at my school does not have regular (or occasional) access to the ICT suite at present and so using ICT in my teaching is limited... I have therefore been piloting the project with a small group of after school Y8 and Y9 pupils."* (Japanese specialist teacher, teacher questionnaire)

In a majority of cases teachers had relatively problem-free experiences of using the technology, though in some cases initial technical difficulties had to be overcome. The developers provided technical support to address these issues. Some teachers reported becoming much more confident, developing their own use of new technologies: *"Use of this material has made me much happier to develop and experiment with other aspects of ICT."* (Latin specialist teacher, teacher questionnaire) In some cases the use and impact of specific technologies was identified, for instance *"If I had to choose one thing that would change my classroom it would be the interactive whiteboard. The effect of the whiteboard is immense."* (Maths teacher, interview) Where technical problems were experienced, some teachers were cautious about using technology-based approaches; for example, *"If our school network works all the time, this project will be really successful and I would like to use it for my normal lessons with Years 8 and 9 but at this moment, I cannot take a risk."* (Japanese specialist teacher, teacher questionnaire) No teachers reported a negative response to the general use of the technology; where reservations were expressed these were in the context of an overall positive response, and related to matters of detail.

Teachers in all subjects responded strongly to the new materials. This was equally the case with newly and recently qualified teachers, and those who were several years further on in their careers. *"In my career in teaching Mathematics this style has had the greatest impact upon learning and motivating students in maths as anything I have experienced."*(Maths teacher, 20+ years experience, teacher questionnaire.) In some cases experience with the project materials resulted in increased aspirations for work with other groups; for example, *"I'd just love to use this say once a week in my normal Y7 and Y8 Japanese lessons."* (Japanese specialist teacher, interview)

In some cases it was clear that exposure to technology-based approaches had prompted teachers to reflect on their own teaching and on how it could be supported or enhanced by the use of new technologies. For instance, *"What I think I would like to use it for in the future is ... to teach specific points while I'm teaching - just stop and ... like "now we're going to look at the website"... just using it as an exciting little thing that you do in the lesson."* (Japanese specialist teacher, interview)

In other cases teachers articulated a direct impact on their classroom practice:*"It's less of me having to draw things up on the board and that sort of thing and I've actually got more time to do the teaching and to wander round the room - I don't have to be the one controlling that* [interactive] *whiteboard...it changes the focus for me and it changes the focus for them."* (Maths specialist teacher, interview) *"My* [project] *lessons are much more structured than my normal lessons - the students are much more involved in discussing their work, strategies, misconceptions etc. The pace is much faster and interest and motivation has been higher."* (Maths specialist teacher, interview) *"There are some things on there that introduce it just as effectively as a teacher working with a group... they can practise really easily... and come back and teach the rest of the group what they've been practising."* (Japanese specialist teacher, interview)

For some teachers, involvement in the project had gone so far as to have been a transforming experience: *"I think it's been absolutely fantastic... I've enjoyed it, the students have obviously enjoyed it ... to start off with it was "I'm just trialling these materials for* [developer]*," and what it's actually become is, it's totally changed my way of teaching so it's actually been a development for me..."* (Mathematics teacher, 9+ years experience)

Discussion and conclusions

Though experiences varied between the three subjects, overall the teacher response was extremely positive. Teachers reported that the experience of being involved in the field trials of the materials had been a professionally developing experience. All had become more aware of the opportunities for using networked and other technologies to support teaching and learning. They had also become more confident and competent as users of the technology required by their particular subject project. In addition, a number of teachers had quickly become adaptive users of the project materials, particularly when local circumstances made this either necessary or possible. Their pedagogical confidence and pedagogical competence (Wild, 1995) in the use of new technologies developed through mutually reinforcing development processes. This was a powerful aspect of teachers' experience during the projects.

Much of teachers' learning over the course of the projects reflects notions of 'situated learning', where the activities resulting in the learning are embedded in the social and physical contexts where the learning is to be used (Brown et al, 1989) – in this case the teachers' own classes. This is related to the feed-back and feed-forward processes operating in the development of pedagogical confidence and competence described above.

There are indications that teachers involved in the projects are engaging to a greater extent in broady constructivist practices. Questionnaire responses show 'whole class teaching' to have been the dominant mode employed by teachers in all three subjects prior to their involvement in the project. Whilst it is not possiblc on the basis of the KS3 subjects on-line project to say that the use of new technologies has shifted teachers' practice in a constructivist direction, direct observation of, and discussion with, project teachers indicate the presence of what Becker and Reil (2000) refer to as 'constructivist compatible' practices involving the use of new technologies associated with the subject materials. The Teaching, Learning and Computers study (Becker 2001) demonstrated that teachers with a constructivist-oriented philosophy were more likely to use computers in their teaching, and also that their practices became more constructivist as a result. Further longitudinal study would reveal if that were to be the case with the teachers in the KS3 subjects on-line project.

Becker and Reil (2000) also identify a relationship between what they describe as 'professionally engaged' teachers (as opposed to 'private practice' teachers) and the use of computers. Again, there are indications of the same relationship in this study. The teachers in the KS3 subjects on-line project were willing to engage in the trialling of new curriculum materials at some considerable cost to themselves in terms of time and extra effort. They were willing to open their practice to outside scrutiny in what was for them a relatively high risk, experimental setting involving considerable innovation and task complexity. This fits with aspects of Becker and Reil's definition of being 'professionally engaged' and demonstrates aspects of what Hargreaves and Goodson (1996) describe as 'postmodern professionalism'.

The use in two of the three subject projects of portable computers by participating teachers, enabled them to undertake considerable self-training in terms of familiarisation with the materials at home, with the portability of the computer and access to the Internet enabling a "further blurring of the spatial distinction between home and school" (Fisher 1999). This use of portable computers to support self-driven teacher development is consistent with the findings of the earlier Multimedia Portables for Teachers Pilot. (Harrison et al, 1998)

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More Than A Movie: Using Animation to Promote Learning of Complex Subject Matter

Joseph Frantiska, Jr. Ed.D.
Visiting Lecturer
Computer Science Department
Fitchburg State College
USA
jfrantiska@aol.com

Abstract: The field of New Media allows for the examination and greater understanding of complex possibly arcane subject matter. One such type of subject matter is tornado formation. This area of scientific information is filled with misconceptions and myths. An animation is a means by which the internal mechanism of tornado formation can be explained. Through such an examination and manipulation of an animation it can be ascertained not only that there is a specific sequence of events of tornado formation but also that there exists distinct stages of the developmental process. The word "manipulation" is important since the learner can view the animation either as a flowing series of images or as distinct images each of which can be individually examined as to it's contribution to the process. This is a subtle yet important empowerment of the learner who is able to perform self directed learning within a structured environment.

Introduction

The stages of tornado formation are unveiled to be themselves as collections of subtle processes in a tremendously dynamic environment. In depth knowledge can be gleaned from each of the processes as individual phenomenon as well as contributors to the whole sequence. A constructivist approach can thus be used to understand this event. From a pedagogical standpoint, this can present the educator with both a unique teaching tool and a greater responsibility to fully understand and explain the phenomenon at both a macroscopic and microscopic level. The impact of this on the teaching process is also examined. The students were split into four groups based on their apparent misconceptions (internal formation process, external formation process, similar phenomenon, no misconceptions). Each group was instructed to enter the website where they saw images, sound files and text that presented counter-examples in a hope to reverse misconceptions and reinforce correct conceptions. All group members saw the animations last. All students were given pre and post-test where they wrote and drew their current understanding of tornado formation.

Theoretical Basis

Cognitive Flexibility Theory (CFT) forms the basis for this study. The main principles of CFT are that learning activities must provide multiple representations of content while instructional materials should avoid oversimplifying the content domain and support context-dependent knowledge. Instruction should be case-based and emphasize knowledge construction, not transmission of information. Knowledge sources should be highly interconnected rather than compartmentalized.

CFT supports the use of hypermedia for learning and provides several design prescriptions for hypermedia that seeks to promote flexible use of complex knowledge. Among these prescriptions are: a.) using case studies to learn abstract concepts instead of learning facts that are removed from their context., b.) presenting information from a variety of perspectives and representations; c.) stressing the complexity of knowledge over the isolation and decontextualization of knowledge, d.) stressing the network and relationships among knowledge; and e.)

involving the learner in the construction of new knowledge via problem-solving tasks rather than the recitation and memorization of facts and concepts.

In CFT, one learns akin to "criss-crossing conceptual landscapes". Issues involved are analyzed in different contexts and from different perspectives. The instructional medium makes such criss-crossing possible and knowledge representations reflect the "criss-crossing that occurred during learning". The criss-crossing nature leads to knowledge structures that can be likened to a web-like form. Hypermedia is particularly well suited as a means to impart these knowledge structures.

Hypermedia based on CFT fall under the constructivist psychological perspective. Constructivism calls for learners to actively participate in the shaping of their own knowledge structures rather than passively receiving facts and concepts. Differing perspectives on constructivism and student engagement range from mechanistic, exogenous views of dependent learners assimilating information given them to organismic endogenous views of independent learners who seek information on their own and accommodate it with pre-existing knowledge into personally relevant constructs.

Where CFT falls short of constructivism, according to Jacobson, et. al. (1996), is in the provision of social context and collaboration. At the center of the constructivist continuum lies the social, dialectical constructivist movement where interactions between the student, instructor, and environment provide the foundation for learning. According to Spiro et al. (1990), popular social constructivist approaches include cognitive apprenticeships and modeling, cooperative learning and reciprocal teaching, and scaffolded instruction in Vygotskian "zones of proximal development" as discussed by Berk, et. al. (1992).

Cognitive Flexibility-based hypermedia are computer based instructional programs that are born from CFT and are built to carry out its operations. The computer's ability to utilize the highly multi-dimensional and web-like structure in multiple ways describes this kind of an educational set-up with the term "random access instruction". According to Jacobson (1995), CFT asserts that students who develop "flexible representations of knowledge" will be able to adapt that knowledge to a wider variety of problem settings.

Website Construction and Animation Impact

The website developed to assess the usage of CFT for the promotion of learning of complex subject matter was composed of text, images, sound files and an animation. The students were divided into groups based upon their specific misconceptions or lack thereof. The animation was the last portion viewed by all groups. The animation is a critical piece in understanding the entire sequences of events that lead to tornado formation. While the previous portions of the treatments showed the student how a tornado forms it is only representative of the part that is directly observable. The animation shows that the formation of a tornado occurs in five distinct phases: a) criss-crossing wind currents, b) a horizontally rotating cylinder of air, c) updrafts which pull the cylinder into a vertical position, d) the transition from a cylinder to the familiar funnel shape and e) the eventual deterioration of the funnel. While of course the animation itself is a continuous sequence of images, this paper only shows the frames that depict the specific phases of formation.

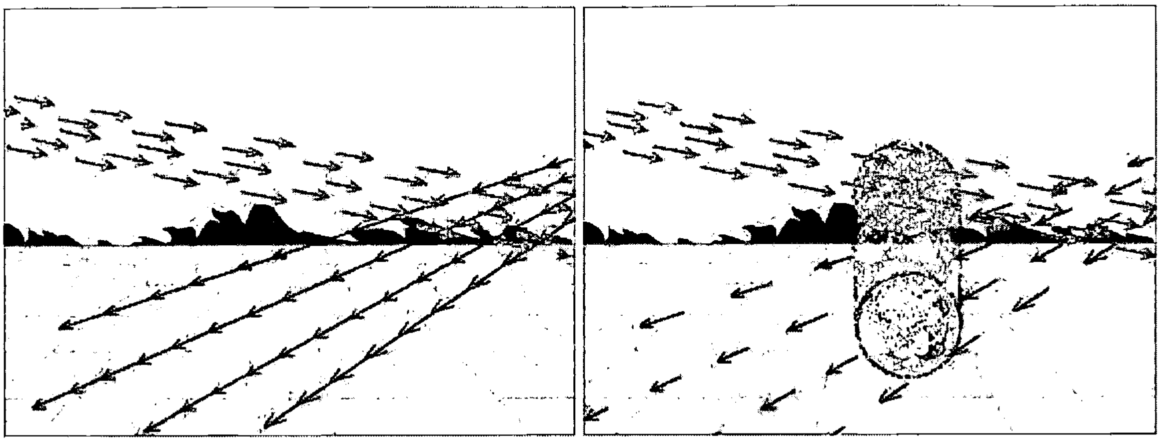

Figure 1 (left) The cross currents which start the rotation. Figure 2 (right) The cross currents form a horizontally rotating cylinder.

Figure 1 starts off the animation with lines that show the direction of criss crossing air currents. These air currents exert some friction on each other as they pass causing a swirling motion. Figure 2 depicts the result of this friction as a swirling horizontal cylinder of air. As momentum increases and the density of air in the cylinder becomes greater, the cylinder takes on a more substantial form. This phase also occurs in the clouds away from direct observation with the animation being the only vehicle by which to see this portion of the formation.

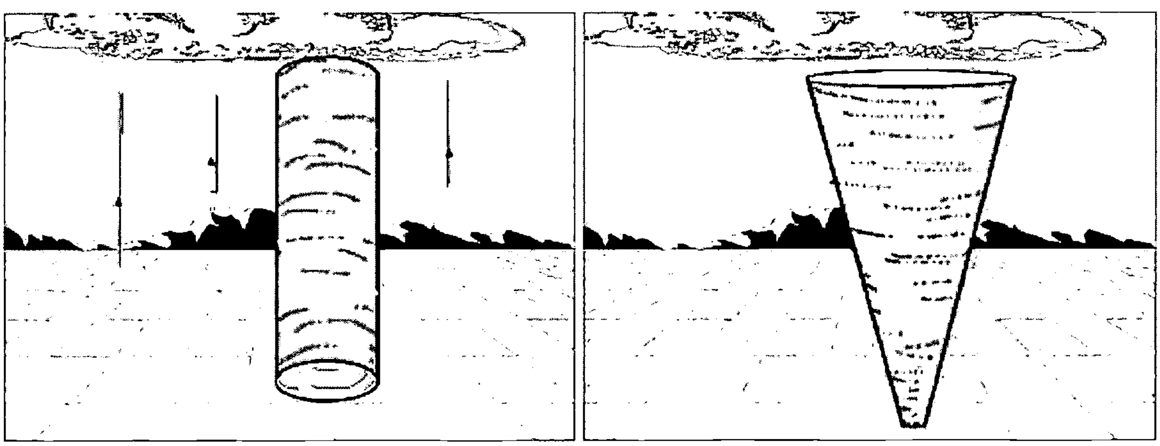

Figure 3 (left) The horizontal cylinder becomes vertical. Figure 4 (right) The creation of a funnel.

Figure 3 shows the updrafts beginning to raise the horizontal cylinder to the vertical. That allows the cylinder to drop to the ground and begin to pick up debris which adds to it's mass which makes the cylinder visible. Due to the conservation of angular momentum, figure 4 shows that the cylinder is taking on a more funnel-like shape. Since the air is filled with more material, the cylinder is more massive and the laws of physics dictate that it must spin faster.

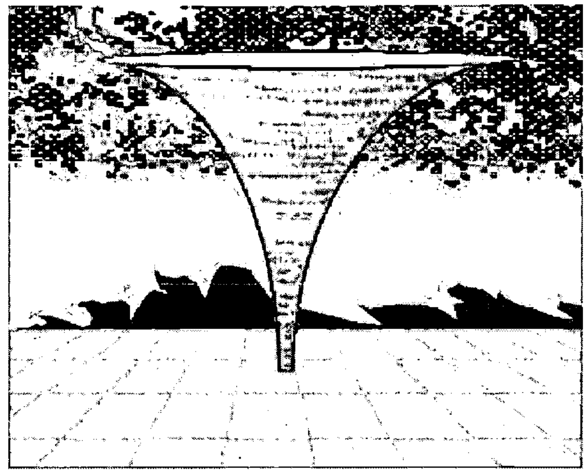

Figure 5 The mature funnel which eventually dissipates.

In figure 5 the tornado has reached a mature stage with a true funnel shape and reaching from cloud to ground. The last stage of dissipation will occur when either the atmospheric conditions fail to provide it with adequate energy or the amount of mass within itself decreases sufficiently.

The animation is itself a major factor and point of contention in the treatment. Specifically, does the addition of an animation with it's flowing graphics and eye-catching motion overpower and minimize the impact of the text and still graphics? Having the students draw the sequence on tornado formation as well as writing about it on both the pre-test and post-tests helped greatly in this respect. Most students displayed a marked improvement in their graphical representation of the sequence of events. Lai (1998) has found that still graphics and animations can increase the level of concept learning produced by computer-based learning. Lai implies that this enforces the dual-coding theory exposed by Paivio (1990). According to the dual-coding theory, two streams of stimuli are better than one. This is in alignment with CFT's criss-crossing landscape of multiple representations.

Results

The findings reveal that as expected the group with no misconceptions almost without exception maintained a correct understanding of the subject matter. Additionally, the students in the group who feel tornadoes were (incorrectly) similar to other weather phenomenon who start with a misconception and were not allowed to change their conceptual view of the phenomenon, showed a 100% occurrence of maintaining their incorrect understanding. This is in spite of the fact that like all other students they saw the currently accepted explanation and animation at the end of the treatment.

Conversely, the groups with misconceptions about the internal or external mechanics of tornadoes who also had initial misconceptions but were allowed to change their conceptual understanding relative to the material encountered had a 63% occurrence of changing from an incorrect to correct concept in the pilot phase of the study. The study proper portion of the study showed a similar propensity.

Conclusions and Recommendations for Further Research

This study has investigated the employment of CFT as a basis for attempting to bring about conceptual change for ill-structured, complex domains. This constructivist approach has used the students' prior misconception(s) of the subject matter as a baseline to guide treatments and to measure the degree of conceptual change.

Guiding the student's construction of the conclusion along thematic paths while allowing them to have a moderate amount of self-direction allows for the correction of false concepts as well as the reinforcement of proper ones. The use of multiple perspectives of a domain in a case-based environment aids this correction and reinforcement by giving the student a number of adequately sized pieces of information allowing for the accurate, rapid construction of correct concepts. Hypermedia allows the student to be guided to a correct answer while allowing the student to largely drive his or her own discovery of the material. Teacher-led instruction can present subject matter via various forms but it can't allow students to explore their own path to the information they need to understand by the very fact that it is teacher led.

In both the pilot and study proper phases, students were able to not only look at information and draw some conclusions but to construct the portions of information that they needed to understand thc phenomenon. This building block approach that is integral to any constructivist type of instruction allowed the pilot students to achieve the main goal of understanding the main concept by first examining the various parts that make up the main concept. The students understood the main portions of tornado formation (wind shear, a rotating horizontal cylinder, turning vertical and narrowing) and were able to examine them separately when necessary. The animation allowed them to see the portions as contributing to an entire process.

Jacobson (1995) suggests "further research could collect data on the student's hypertext traversal patterns that could help clarify the relationship between epistemic beliefs, learning with hypertext, and knowledge transfer". Students with simple epistemic beliefs may be found to be struggling with complex hypertext environments as seems to be the case. Spiro, et. al. (1990) suggest that further research be conducted to "investigate how students with simple epistemic beliefs can be better prepared to use and learn from an instructional approach such as the Thematic Criss-Crossing Hypertext, which employs multiple knowledge representations and nonlinear linkages to demonstrate various knowledge component interrelationships". Also, more work needs to be done in understanding how to best combine the continuity of animations with the specific points made by images and text. Helping these different types of media to compliment each other will provide a strong yet flexible teaching and learning tool.

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Quality Metadata Scheme xQMS for an Improved Information Discovery Process for Scholar Work within the xFIND Environment

Christian Gütl
Institute for Information Processing and Computer supported new Media (IICM)
Infodelio Information Systems, Graz, Austria
GÜTL IT Research & Consulting, Graz, Austria
cguetl@acm.org

Maja Pivec
Information Design
University of Applied Sciences Graz, Austria
maja.pivec@fh-joanneum.at

Victor Manuel García Barrios
Institute for Information Processing and Computer supported new Media (IICM)
Graz University of Technology, Austria
vgarcia@iicm.edu

Abstract: Experiences showed that an advanced set of metadata has to be provided for discovery, retrieval and evaluation of Internet sources for scholar work. In this paper we describe the Quality Metadata Scheme and its implementation within the smart search system xFIND for scholar work. The proposed idea may be seen as a further step to a more semantic World Wide Web for the scholar community.

Motivation

At the IICM we had long-term experiences in the fields of web based learning systems, for example (Dietinger et al. 1998), hypermedia systems like (Hyperwave 2001), and knowledge discovery, as with (xFIND 2001). The praxis showed that common metadata fields and full-text search within the knowledge discovery process on the Internet do not meet users' needs. This led us to propose that one of the key issues of modern search systems is to provide and manage quality metadata for Internet sources.

A fast-growing number of users, applying the Internet for a variety of objectives is affected with a dramatic increase of information and services on the Internet. In consideration of that fact, shortcomings can be identified as follows: anyone can publish anything without quality control and accuracy, problem of misinformation, unauthorized users can change or even add new content on foreign Web sites, and missing meta-information about the authority and reliability of information and services. The problems stated so far have great impact at the users (students, teachers, librarians, scientists, etc.) of the scholar community.

To counteract the problems mentioned above, additional information has to be provided to improve the information discovery and retrieval process as well as the evaluation of Internet resources. We propose the compilation of descriptive and evaluative characteristics, which may describe the applicability and therefore the quality related to a particular information need. Thus, we call such a set of attributes a Quality Metadata Scheme (QMS). We advocate the opinion that in the field of scholar work a QMS has to provide – at least - information about the authority of information resource or services, the target audience, the expertise level (beginners, advanced or experts), and a standardized classification scheme. The quality metadata framework within the smart search service xFIND (xFIND 2001) is called xQMS.

xQMS: The Basic Idea and its Implementation within the xFIND Search System

The proposed framework allows managing the quality metadata physically separated from original information within the xFIND system. It is designed and implemented as a multi-level process. That means that at the first level authors, students, publishers and providers can add interesting material by submitting xQMS sets for an entire Web server, a Web area, a particular page or a section of a document. On the second level a "xQMS administrator" reviews the information submitted by the person of the first level and enables the resource to render them searchable. On a third level teachers, librarians and subject domain level experts can review the resources and its xQMS entities as well as add their own xQMS entities. Such an approach will allow building a growing system of relevant information for a particular lecture, a particular subject, etc. The system is designed in a distributed manner, which allows the co-operation of lectures, departments and even universities and scholar organizations. For example, authorities of lectures about national history of different universities can build up a reviewed repository of interesting Web resources for their students. Thus, the repository can be fed with interesting resources according to scholar work of students. They have to add interesting Web resources at the xQMS system and enlarge the information with a xQMS record. After the review process, other students can use the growing repository for their own scholar work. The novel idea is that existing web resources are indexed by an advanced search system (xFIND 2001) and in addition, varieties of quality aspects are assigned to the resources within a multi-level rating process. The document content as well as quality aspects can be used in combination to process queries.

xQMS enables to specify the quality of Internet resources for scholar work and consists of descriptive and evaluative characteristics. *Descriptive attributes* comprise information about the author, the organization and the publisher as well as information about the resource (title, keywords, description and language, type of resource). Related topics can be assigned by the usage of the Dewey Decimal Classification (DDC) code. In addition, a research community dependent classification code (e.g. ACM for computer science) allows specifying the related subjects more granular. Within the search process, either DDC or a community dependent classification code may be used to define the semantic scope of the search. *Evaluative attributes* comprise the diction of the resource, target audience (age of the audience, expertise level of audience), authority, depth of information and width of information. It is our opinion, that evaluative attributes represent subjective values just for a particular community (e.g. a high school, university, etc.). Thus, different communities have to be enabled to manage their own xQMS records. The xQMS framework enables to manage xQMS sets for different communities and allows to select a particular set for search requests.

To give an idea how powerful the system is, an example is stated as follows. A student can process a query to find information for beginners in computer science with easy diction and containing "mySQL database" in headings of the documents. Furthermore, the students can also be supported within their browsing process by being supplied with xQMS information related to the Internet resources (a first prototype is implemented for Netscape 6.x exploiting XUL functionality).

The solution introduced will improve the search process as well as help to evaluate chunks of information within the process of browsing. Scholar workers are enabled to specify query terms containing descriptive and evaluative aspects. Furthermore, the scholar community will get a useful tool to build up and maintain their meta-knowledge of online resources according to their needs.

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Preparing for Digital Story Telling

Ellen Brinkley
Robert Leneway
Allen Webb
Western Michigan University
Corey Harbaugh
Gobles High School
Gobles, Michigan
United States
Ellen.Brinkley@wmich.edu

Abstract: Internet II is about to become commonly available to many educational users. As Internet I turned many of us into text editors, Internet II will cry out for many of to become video producers. How do we prepare both our student and ourselves, especially those preparing to become teachers for this brave new world of digital video? How do we prepare for a world of viewers that will expect and demand of us high impact video communications? At Western Michigan University, with much help from the K-12 community, and the Center for Digital Storytelling, we are beginning to explore how to combine the video digital technology with the ancient art of story telling to better prepare pre-service students to meet the rigors of first year teaching and veteran teachers to better prepare and share digital media of their reflective experiences as teachers.

Introduction

In five minutes L___[female] and C____[male] describe what it's like to work as first-year teachers in the same small Michigan school district where they were once students. In five minutes R___[female] and L___[female] demonstrate for pre-service teachers and others how they call upon the power of place to teach students in different rural communities to take ownership of both their writings and the places they live. In five minutes P___[female] tells the story of her lifelong journey to name herself "writer" and the impact that journey has had on teaching and learning in her high school English classroom. These teachers, all of whom serve as classroom mentors for pre-service teachers, were able to create their five-minute stories during an institute last July on the campus of Western Michigan University in Kalamazoo, MI, using a process called *digital storytelling*; the process combines the timeless art of storytelling with new and powerful digital multimedia tools. For these teachers, and for others who have experienced digital storytelling, it is the technology application that finally delivers to their teaching practice the real power of a computer as a teaching and learning tool.

To an audience a finished digital story looks something like a short autobiographical, documentary film. Storytellers begin the process by writing and recording a personal narrative script, which becomes a spoken-text "voiceover" for the visual (and other auditory) elements of the piece. Then, storytellers use software to layer their voiceovers with any images that help tell the story: still photos, video clips, artifacts, text and non-text animation, soundtrack, and video and audio effects. To the storyteller, a digital story is a highly personal and densely packed exploration of a topic through story. But the real power of digital storytelling is something that happens between audience and storyteller, in how the experience of digital story can bring people together for conversations about the subjects and topics a story explores and suggests. To bring audience and storyteller together, a digital story can be stored and played on any computer application that supports the software to run it: personal computers can be used for individual viewers, data projectors work for a room full of viewers, and for the world, digital stories can be carried over the internet and played on media players like QuickTime and Real Player.

From Berkeley to Kalamazoo

The Digital Storytelling Institute came to Kalamazoo when Gobles, Michigan, high school teacher and mentor teacher Corey Harbaugh made a promise in Berkeley, California, the summer before. He went out to Berkeley in the summer of 2000 at the invitation of the National Writing Project (NWP) to make a digital story about his work in the Rural Voices, Country Schools project—an initiative of the Annenberg Rural Schools and Community Trust and the National Writing Project—that documented and celebrated the success of America's small-town schools. He had never heard of digital storytelling before accepting the invitation, but at the end of his week in California he was so transformed by it that he promised Caleb Paull, the Education Programs Dirдctor at thc Cеntеr for Digital Storytelling, that he would find the resources to bring him to Michigan as soon as he could to share the power of digital storytelling with others back home.

Several of his teaching partners on the Michigan Rural Voices, Country Schools team immediately recognized themselves and their work in his five-minute personal story, and they wept and laughed all over again when they heard and saw the story being played. Team mentor Dr. Ellen Brinkley, a WMU English Education professor and Director of the Third Coast Writing Project, recognized its power as a professional development tool for teachers and for pre-service teachers, and enlisted the support of Dr. Allen Webb, a Western Michigan University PT3 College of Arts and Sciences Coordinator and English Education professor.

The Institute

The Institute was held during a hot July week of 2001. Though the institute was scheduled to end at five each evening, most nights participants didn't leave Rood Hall until giving in to fatigue and hunger between eight and nine p.m. Participants were glued to their computers and the other tools of the story-making process: scanners, digital cameras, audio and video equipment, and the Internet. On Thursday night, permission was secured from the university for the institute to lock up when they left, and teaching veterans of thirty years pulled something like all-nighters to finish their stories before the institute was scheduled to end the next day. Several of the teams took more than forty hours to produce those five-minute stories.

On the last day of the institute a screening of stories was held at a campus reception for more than one hundred friends and family members, teaching colleagues and school administrators, guests and supporters from the university, and members of the media and legislative communities. Teachers briefly introduced themselves and their pieces to the group, and then let the finished stories have their say. When the lights came on again some forty minutes later, people got off their feet and started having conversations with the storytellers and with each other that had been raised by the work: about teaching and technology, about standards in education, about professional development, about best practice, and about why and how teachers do what they do. The conversations lasted all afternoon.

Conclusion

At Western Michigan University, work continues to explore digital storytelling as a teaching and learning tool in the PT3-supported teacher preparation program. With additional support from the PT3 project, Allen Webb, Ellen Brinkley, and another colleague, Jonathan Bush, are teaching pre-service teachers in a wireless lab and integrating digital storytelling into their class requirements for English education students. They plan to invite faculty colleagues who work with pre-service teachers to participate in a seminar during the summer of 2002 in order to extend digital storytelling into other pre-service and technology preparation coursework.

Since last summer's institute Corey has shown digital stories and presented on the institute to hundreds of people from across the country. He reports that each time he puts the work in front of a new audience, he experiences again the energy and excitement of digital storytelling that he felt when he was introduced to it in the summer of 2000. Audiences respond both to the power of personal narrative, and to the multimedia format storytellers have used to layer and condense each individual piece. At every conference and forum, people introduced to digital storytelling want to know how they can do it themselves, or how to bring a mentor to their site to lead a workshop.

We have learned at WMU that it takes a powerful application to get mentor teachers and faculty—especially veterans—to want to integrate technology into the classroom. They have to experience the power of technology before they will believe in it enough to use it. Yet so many technology-training programs get the most important relationship backwards, making the technology more important than the learning it supports. Digital storytelling does not make this mistake. It immerses storytellers into the process—to condense their lives and teacher stories into five-minute pieces, teachers have to learn how to use the tools of technology—so in the end there is no difference between the technology and the learning that takes place. This result is precisely the goal of PT3 teacher preparation in the hands of learners who have experienced the combined power of technology and meaningful work: Teaching and learning can be fundamentally changed.

Acknowledgements

COREY HARBAUGH is a high school English teacher at Gobles High School (MI), and a teacher consultant for the Third Coast Writing Project at Western Michigan University.

ELLEN BRINKLEY is a Professor of English education at Western Michigan University and Director of the Third Coast Writing Project at Western Michigan University

ALLEN WEBB is an Associate Professor and the Preparing Tomorrow's Teachers to Use Technology (PT3) Coordinator of Arts and Science Project at Western Michigan University

ROBERT LENEWAY is Director of the Preparing Tomorrow's Teachers to Use Technology (PT3) at Western Michigan University

The Benefits of Streaming Media in E-learning

Rich Mavrogeanes, VBrick Systems, US

From students in an elementary school classroom to executives in a corporation, innovations in technology, particularly the introduction of streaming media in the learning environment, have made it possible for learning to be more convenient, more exciting and more interactive. For schools, streaming media has makes it possible for students to learn about and understand the importance of technology, while using a new and exciting method of teaching. In universities, streaming media makes it possible for more students to take classes without incurring the cost of building new space to cater to a larger amount of students. It also makes it more convenient for students to take classes, by being able to learn from their computer, at a remote location. Finally, in the case of corporations, streaming media used for e-learning offers businesses a cost-effective and easy to implement method of training employees, which has become increasingly important in today's chilly economic climate.

Interactive computer-based technology in EFL
Alexandra McCormack

Interactive multimedia provides students with highly motivating educational environments and enhanced learning contexts. This computer-based technology allows learners to interact with a variety of multimedia elements as well as to take an active participation in their own learning process. The observation of both students' poor language competence and lack of motivation in reading comprehension courses led to the design of an interactive multimedia program: *Interactive English*. The objective of this work is to present this interactive computer-based program for teaching reading comprehension to foreign language learners of English.

Recently, the popularity of the use of multimedia application in education has highly increased. The development of this educational tool has led to a redefinition of the roles of the teacher and student, has intensified teacher training in the area of computer assisted education and has also promoted the analysis of the advantages and limitations of the use of new technologies as an instruction medium. Major changes are widely observed in the utilization of multimedia programs in classroom contexts. While students become responsible of their own learning process, educators play the role of a guide in the learning process by helping students potentiate the use of technology in the process of knowledge construction.

Within this scenario, where students play a major role, it is possible to emphasize certain capacities so that students can face real life learning situations by developing ways of "learning to learn". Thus, instead of assimilating specific concepts, students are prepared to utilize information, enlarge and process it in a variety of contexts that respond to their own interests and motivation. In this process of active knowledge construction, students are supported by computer-based technologies that provide them with opportunities for developing skills for formulating questions rather than for obtaining responses, thus arousing exploration and discovery. Moreover when students use multimedia or interactive multimedia, they must take more decisions as regards how to guide their learning, and as a result become organizers of their own process.

The development of multimedia technologies in education provide potentialities and capacities on the basis of specific technological concepts. In the development and use of multimedia applications both educators and students are encouraged to have an understanding of the concepts underlying multimedia so as to attain an appropriate selection, design and utilization of such technologies. Traditional media such as textbooks, pictures, or analog video have been used by teachers alternatively with the objective of motivating students and enhancing learning contexts. The combination of these technological media by means of computer programming results in the development of a multimedia application. Currently, computer-based technology combines all those elements or part of them in a single application allowing for direct student intervention. This focus on students' active participation enhances their opportunities not only for knowledge construction but also for reflection on their own learning process.

This interactive mult imedia application, *Interactive English,* has been designed on the basis of the functional approach to reading and includes functions, vocabulary and grammar contextualized in the scientific and technical field. The target audience for this program is comp osed of undergraduate students enrolled in Teacher Training and Reading Comprehension courses, at the Universidad Nacional de Rio Cuarto, Argentina. The audience has a high degree of extrinsic motivation as regards:

- accessing bibliography of the students' specific field.
- achieving objectives through a non time-consuming program.
- exercising individual user control and pacing
- providing immediate feedback and response.
- allowing for different styles of learners.

The program allows for interactive practice that ensures the attainment of the instructional objectives. A non linear approach to instruction provides suitable format to attain the objectives proposed. A storyboard shows an individualized language environment, in which students are able to interact with written texts provided by the program, as well as to receive immediate feedback. The screen layout shows navigation buttons that allow students to choose which section to access: *Instruction*, *Practice* or *Feedback*. Each instruction section is connected to a practice section that provides a variety of activities, depending on the content and instructional objectives. From both instruction and practice sections, feedback is made available, once students have fulfilled the activities. Instructional objectives can be attained by students working at their own pace. All instructional objectives require quick accessed feedback and navigational responses. The display of this presentation exemplifies different aspects of the program taking into consideration that:

- The content of the program is mainly text-based. The use of short, readable texts makes the program easily and effectively delivered.
- The program allows for easy delivery of graphics and animation.
- Content items may be accessed in a non linear format, thus giving control to the user.
- The program provides the user editing tools and the possibility of updating information immediately.
- The program provides interactive feedback in the combination of instruction and practice.
- The program allows for alternative "hints" in the practice sections if the user needs them.

Navigation is presented through screen sequencing, starting with introductory page in which many-colored words attract the users' attention. Next, the title page *Interactive English*, opens up showing an "introduction" button that familiarizes the user with the main objective of the program, the intended audience, as well as with the form and function of the program. On this page there is also a "help" button that acquaints the user with the navigation buttons and other features required to move through the different sections. On the title page, a "next" button, takes the learner to the next page, containing the main menu. The main menu consists of seven text fields: Defining, Describing, Classifying, Asking/Answering, Suggesting, Narrating and Predicting. The student may click on any of these text fields and is automatically taken to a submenu providing the specific content items for instruction. Each of these content items is connected to a page containing the instruction (explanation, rule, definition or construction) and displays the context (text or graphic) to which the instruction is related. For the sake of facilitating comprehension, one text may be used as a context for instruction of different language functions, i. e. it may be shared by several other content items. Each instruction section is connected to a practice section that provides a variety of activities, such as: multiple choice, true-false, ordering, matching, completing, or drag and drop, depending on the content and instructional objectives.

Feedback is provided, once the students have fulfilled the practice activities, by showing reinforcement prompts or hints depending on whether the user provided a correct or incorrect answer. Individual scores are saved by a record-keeping feature, which can accessed from the main menu. The student is allowed back into the sub menu or main menu from any of the sections, by clicking on "menu" button. Finally, navigation buttons provide different choices, as: next, back, quit, menu. These allow the user to choose which section the user prefers. The screen layout will show small icons to help the student differentiate among the main sections: Instruction, Practice and Feedback. Other reminders of the users' navigation movements are also provided. Furthermore, multimedia elements, such as: text, images, sound icons and animation as well as hyperlinks, buttons or other clickable objects, which relate to interactive multimedia in a computer-based application are displayed.

Interactive English is available under a PC format and runs with Toolbook 4, by Asymetrix, or in a runtime version. The program can be run under Microsoft Windows and has quick access to common features of the Windows environment. The program can be accessed on a runtime version for users who do not have the full version of the program.

Adaptive Profiling Tool for Teacher Education

Miikka Miettinen[1], Petri Nokelainen[1], Jaakko Kurhila[2], Tomi Silander[1], Henry Tirri[1]

firstname.lastname@helsinki.fi

[1] Helsinki Institute for Information Technology
Complex Systems Computation Group
P.O. Box 9800, 02015 HUT, Finland
Tel: + 358 9 850 11576, Fax: + 358 9 694 9768

[2] University of Helsinki
Department of Computer Science
P.O. Box 26, 00014 Univ. of Helsinki, Finland
Tel: + 358 9 1911, Fax: + 358 9 191 44441

Abstract: In this paper we introduce EDUFORM, an adaptive questionnaire designed for profiling students in various educational contexts. The idea is to build a probabilistic model from previously gathered data, and use it for profiling other people more efficiently. EDUFORM selects the questions presented to each individual adaptively in order to minimize the number of answers needed for reliable prediction of the profile. Empirical evaluations suggest that 85-90% accuracy can be achieved, while the number of questions is reduced by 30-50%.

Introduction

The information needs involved in organizing effective education are significant. Accurate knowledge of interests, preferences, and motivation aspects is important both for the daily activities of educational institutions and for longer-term research and development efforts. In addition, computer technology enables such information to be used for the immediate benefit of the students. Self-assessment tools can be developed to offer analyses of for example learning styles or metacognitive skills, and adaptive systems to adjust the content or presentation of the material to individual needs. The problem is that nearly all of the interesting and useful information has to be provided explicitly by the students, which easily leads to excessive use of questionnaires. Besides being undesirable in itself, the tedious and sometimes frustrating answering process associated with long questionnaires is likely to reduce the validity of the acquired data.

In order to address this problem, we have developed EDUFORM, an adaptive on-line questionnaire. The idea behind EDUFORM is to build a model from previously gathered data and use it for profiling other students on the basis of a subset of the propositions in the original questionnaire. Furthermore, the propositions and the order in which they are presented are chosen on the basis of the previous answers of a particular individual. Preliminary empirical evaluations suggest that good profiling accuracy can be achieved with a significantly reduced number of propositions.

Modeling approach

The development of EDUFORM was motivated primarily by an observed need to profile students in various educational contexts. Although such profiles can in principle be derived in a theory-driven manner and coded manually, we have adopted a data-driven viewpoint, which means that the profiles are constructed from data gathered previously with similar questionnaires. This leads to the distinction of two phases in the use of EDUFORM: the *Profile creation phase*, where characteristic groups of students are identified, and the *Query phase*, where the constructed profiles are used for predicting the answers of other individuals to the same questionnaire. The design is generic and allows the application of any kind of predictive modules suitable for the task. We have adopted the Bayesian approach (Bernardo and Smith, 2000) and use the language of probability distributions to describe the profiles.

If Q denotes the filled-in questionnaire, each group G_i can be described as a mechanism that assigns a probability $P(Q \mid G_i)$ to the questionnaire. The set of groups $G = (G_1, G_2, \ldots, G_K)$, together with their relative sizes $s = (s_1, s_2, \ldots, s_K)$, define a finite mixture (Titterington et al. 1985) that can be treated as a probability model $P(Q \mid G, s) = s_1 P(Q \mid G_1) + s_2 P(Q \mid G_2) + \ldots + s_K P(Q \mid G_K)$.

As the adaptive questionnaire is being completed, the probabilities are updated to reflect the new information gained from the answers. The model is used for calculating the probabilities of possible answers to the yet unanswered questions (Q_U) on the basis of the answered questions (Q_A):

$$P(Q_U \mid Q_A, G, s) \propto P(Q_U, Q_A \mid G, s) = P(Q \mid G, s).$$

We can also keep track of the probability that the person belongs to a particular group G_i. If we denote by g the event that the person belongs to the group G_g,

$$P(g \mid Q_A, G, s) \propto P(g, Q_A \mid G, s) = P(g \mid G, s)\, P(Q_A \mid g, G, s) = s_g\, P(Q_A \mid G_g)$$

The two calculations above let us try to adapt the order of the questions so that we can predict the answers of the unanswered questions confidently enough and/or be confident about the group membership of the student based on as few answered questions as possible. Johnson and Albert (1999, 191) have proposed an alternative approach based on the estimation of item specific model parameters.

Construction of finite mixtures from data is described in (Kontkanen et al. 1996) and (Tirri et al. 1996). The underlying intuitive idea is to describe the data vectors with respect to a set of prototypes, so that the description of an individual vector consists of the index of the closest prototype and a list of differences between the expected and observed values. Alternative definitions of the prototypes can be evaluated on the basis of the amount of information needed to describe the entire data set: the more representative our prototypes are, the fewer differences there are between the data vectors and their associated prototypes. In addition to being of significant interest in itself, the resultant model is suitable for the kind of prediction needed in the *Query phase.*

EDUFORM

Even though EDUFORM is an electronic questionnaire on-line, it resembles traditional questionnaires on paper (Fig. 1). A few multiple-choice questions are presented at a time, with the possibility of adding comments. The navigation bar is at the bottom. The arrows on the right allow the user to move to the next or previous set of questions. Clicking the button with the pie chart icon shows the current profile. When the profile of the user is known with sufficient certainty, the user can quit filling in the questionnaire before all questions have been asked by clicking the 'cross' button on the navigation bar. On the left, there is a progress indicator showing an estimate of the amount of questions left. Because of the simplicity of the interface, there has been no need for a separate help screen. The meanings of the buttons are shown as tool tips (in Fig. 1, the word "Next" above the mouse pointer).

Adaptation in EDUFORM

In the *Query phase,* we want to find out the profile of the student as efficiently as possible. The profile is represented by a probability distribution over the groups identified in the *Profile creation phase.* As the student answers the questions, some of the groups become much more likely than others, and one of them often reaches almost 100% probability reasonably quickly. EDUFORM takes advantage of this characteristic pattern by optimizing the order in which the questions are presented, and offering the student an opportunity to quit once sufficient certainty about his profile has been achieved.

At any point in time, the most informative set of questions to ask next is the one that changes the profile distribution most. EDUFORM searches for this set by maximizing the expected *Kullback-Leibler distance* (Cover and Thomas 1991) between the current distribution and the distribution that would result if answers to a particular set of additional questions were received. The first questions are the same for everybody, but after that the selection depends on t he previous answers of each individual. Therefore, adaptation in EDUFORM is based on continuous assessment of the expected information gain, rather than being limited to a small number of hard-coded paths.

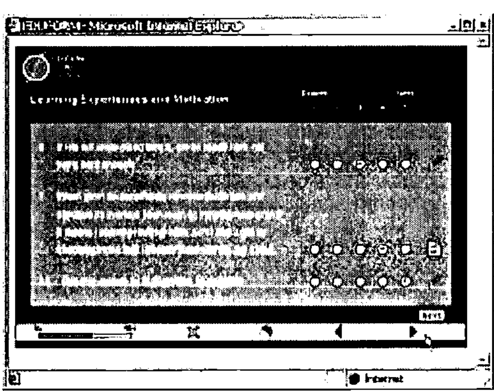

Figure 1: The user interface of EDUFORM.

The purpose of this technique is to minimize the amount of questions needed to find out the student's profile. Additional questions can be omitted entirely once a sufficient degree of certainty has been achieved. In the current experimental version of EDUFORM , the termination criterion is defined by setting a limit, which the most probable group in the profile has to exceed. A limit of 75% to 85% seems to be a suitable range in most cases. It is also possible to specify an additional requirement regarding the stability of the profile. For example, it may be stated that the most probable group has to stay above the limit for two successive sets of answers.

Figure 2 shows the format in which the data is saved. The first column identifies the person. In this particular case, a unique identification string has been created from the questionnaire name ("demo") and a counter. The questions appear in the same order as they were presented to the user. Question numbers are in the second column. The remaining columns contain the probabilities of the alternative answers. If the user has actually answered the question, one of the probabilities is 1 and the rest are 0. Probability distributions for the omitted questions are calculated by the model and saved in the same file. In Figure 2, the first four questions have been answered by the user, and the last two rows are predictions. Additional data include comments, the final profile, and a log of mouse clicks. The main purpose of the log is to record the time used for answering various parts of the questionnaire, but it may also turn out to be helpful in identifying ambiguous questions or making detailed analyses of differences between groups.

```
demo-1  33     0.0     1.0     0.0     0.0     0.0
demo-1  15     0.0     1.0     0.0     0.0     0.0
demo-1  10     0.0     0.0     0.0     1.0     0.0
demo-1  27     0.0     0.0     0.0     1.0     0.0
demo-1  5      0.0149  0.0292  0.1225  0.2392  0.5939
demo-1  11     0.0084  0.0086  0.0422  0.2451  0.6954
```

Figure 2: Format of the saved data.

Empirical results

Perhaps the most important question to ask when judging the value of EDUFORM is whether or not it actually works. The number of answers needed for reliable profiling should be significantly smaller than the total number of propositions in the questionnaire. We would also like the users to benefit from adaptivity and quit when they are offered a chance to do so.

In order to evaluate the predictive performance of EDUFORM, we simulated the operation of the adaptive questionnaire using complete data. The models were constructed from 200 randomly selected cases in each data set, and the remaining test cases were supplied to the models exactly as they would have been received during the course of adaptive questioning. The number of answers given before the fulfillment of the termination criteria was recorded, and the group predicted at that point was compared to the group assigned at the end of the questionnaire. If the predicted group did not match the final group, an error was recorded.

Table 1 shows the main results of the simulation. Two different data sets were available from a questionnaire (Ruohotie 2001) with four sections: "Learning and motivation" (Motiv in Tab. 1), "Study habits" (Habits), "The quality of teaching" (Teaching), and "The effects and outcomes of education" (Effects). Although the sections measure complementary aspects of the same educational setting, they are in the present context best thought of as separate questionnaires. The last data set (Motprof) is from a questionnaire designed for identifying motivational profiles. The second and third columns contain the number of groups defined during model construction and the total number of questions in the questionnaire. The average proportion of questions needed for predicting the group of a test case is in the column labelled "Questions asked". The next two columns contain the standard deviation of questions asked and the proportion of test cases for which the final group differed from the group predicted upon the fulfilment of the termination criteria.

Data set	Groups	Number of questions	Questions asked	Standard dev. of quest. asked	Errors	Number of test cases
Motiv 1	4	28	62%	22%	10%	260
Motiv 2	4	28	65%	22%	15%	357
Habits 1	5	40	62%	22%	15%	260
Habits 2	5	40	48%	21%	13%	357
Teaching 1	5	23	67%	21%	13%	260
Teaching 2	5	23	53%	24%	15%	357
Effects 1	5	25	61%	22%	14%	260
Effects 2	5	25	45%	23%	14%	357
Motprof	6	34	70%	21%	15%	498

Table 1: Predictive performance of EDUFORM.

As can be seen in Table 1, an average of 50-70% of the questions had to be asked to achieve an error rate of 10-15%. Every data set contained a few exceptional cases for which 100% or only 15-30% of the answers were needed, but the standard deviations were consistently within 20-25% of the total number of questions in the questionnaire.

The trade-off between questions and errors can be altered by adjusting the termination criteria. The more uncertainty we accept in the profile, the fewer questions need to be asked. Figure 3 shows the effect of additional answers in the Motprof data set. On the horizontal axis we have the number of answers given, and on the vertical axis the average Kullback-Leibler distance between the predicted and the final profile. By setting the termination criteria to appropriate values, questioning can be stopped approximately at the desired point along the line.

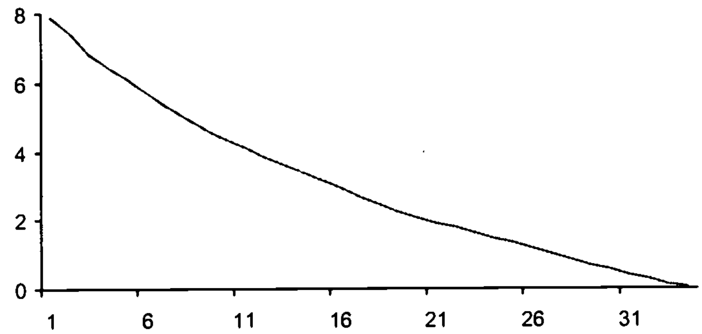

Figure 3: Reduction in the distance between the predicted and the final profile.

At the time of writing, two data sets had been gathered with the adaptive version of EDUFORM. The same sets of questions were used as in the simulation study described above. Of particular interest for the present purpose is the attitude of the users towards prediction. When their predicted profile satisfied the termination criteria, they were asked if they want to quit or refine the profile by answering the remaining questions. They could also quit after answering only some of the additional questions. The decision to quit or continue can be seen as a reflection of the user's opinion about the usefulness of adaptation in EDUFORM.

The results are summarized in Table 2. The first four questionnaires were parts of the same study, and were completed sequentially during one session. The subjects were students from a teacher training programme in the Finnish Polytechnic Institute. In the other study ("Motprof"), motivational characteristics of engineering students from Helsinki University of Technology were examined. The second column contains the proportion of users who quitted before answering all questions. Unfortunately, it seems that adaptivity was not appreciated as much as we thought. The third column shows the number of questions answered by the students who did take advantage of the adaptivity. The second part of the first study ("Habits") was the longest one with 40 propositions. The proportion of answered questions is high because many students gave a few more answers after they had the first chance to quit, but got tired before the end.

Questionnaire	Allowed prediction	Questions answered	Total number of cases
Motiv	11%	64%	66
Habits	35%	82%	66
Teaching	20%	61%	66
Effects	17%	68%	66
Motprof	26%	61%	478

Table 2: The adaptivity of EDUFORM in real use.

Conclusions

EDUFORM is a tool to provide questionnaires with reduced sets of questions. The operation (i.e. the adaptation of the amount of questions) is independent from the questionnaire content. This domain-independence of the adaptation mechanism opens up the possibility to use EDUFORM for more than just a single purpose. For example, EDUFORM can be used in assessing individual differences on-line to support studying in a virtual or traditional campus university. Suitable support material for student self-evaluation could be a questionnaire that provides information of how to study efficiently.

A questionnaire in EDFORM can also be used as a test for students. Testing the students' knowledge on the basis of adaptive questioning is not a novel idea. However, the standard approach is that the system adapts directly to the knowledge of the student. When using EDUFORM as a test, adaptation means the optimization of the length of the test. In other words, the goal is to provide the teacher or evaluator enough information about the students' progress with as few questions as possible.

Because of the particular approach to adaptation, EDUFORM can also be used as a tool for creating user profiles for adaptive educational systems. Sufficient knowledge of the characteristics of the user is a necessary prerequisite for effective adaptation. Some systems are able to accumulate useful data during the course of the interaction, but additional input must almost always be provided explicitly by the user (Brusilovsky 2001). EDUFORM can be employed to gather this information efficiently and create probabilistic user profiles for direct application in the adaptive educational system.

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Learning about Learning Objects with Learning Objects

Sandy Mills
AliveTek, Inc.
Seminole, Florida
United States
sandy@alivetek.com

Abstract: The term "Learning Object" has been getting a bit of attention in the world of online education lately, but very few completely understand what a learning object is. There are many definitions out there, but because text is used as the medium, the true meaning is often missed. This paper has been written to further define the term, and to serve as a compliment to an interactive session that will allow participants the opportunity to investigate various learning objects. Since learning objects are usually designed for active learning, this interactive session will allow for participants to see, hear, and interact with learning objects of varying educational levels and subjects. Samples will include objects created with Flash, Director, Shockwave, and interactive databases. Issues such as developmental skill level, funding and organizing learning objects will be discussed. Resources include some of the latest research on learning objects, as well as URL's for online repositories that can be shared with teachers from around the globe.

Introduction and Definition

Many have attempted to define the term, "learning object," but with the rapid pace of technological advancements and web-based learning theory evolution, the definition is still taking shape. There are many commonalities among the prominent definitions provided by leading researchers, but the exactness of what constitutes a learning object is still being discussed. In many instances, the technical specifications are close to becoming defined as many standards-setting organizations attempt to organize and standardized digital content (Saad, Uskov), but often in these definitions the educational dimensions are barely touched upon or ignored all together.

There are some rather enticing grants offered by educational organizations such as the National Science Foundation (https://www.fastlane.nsf.gov/servlet/A6QueryList) to further advance research in this area but most studies are focused on the technical parameters for the purpose of tagging and storing objects and are in early stages of research. As well, the training and development industry is also attempting to leverage the power of reusable and portable learning objects to further strengthen the argument for designing and developing such items. Organizational leaders such as Cisco, Honeywell, and American Express have all implemented learning object approaches to increase the effectiveness of their learning materials.

Longmire attempts to combine both technical elements with educational elements when he cites "flexibility, ease of updates, searches and content management, customization, interoperability, facilitation of competency-based learning, increased value of content" as advantages of designing and using learning objects. Barron cited Longmire when he wrote, "A new model for digital learning—one in which learning content is free from proprietary 'containers,' can flow among different systems and be mixed, reused, and updated continuously is inching closer to reality. At the center of this new model is the learning object, the modular building block that allows such a dynamic approach to managing e-learning content." WBT Systems Ltd. is very focused on providing a learning objects library infrastructure, and wrote in the company's 2001 white paper, "At its simplest level, learning objects are re-usable building blocks of learning" and points out that it is rather difficult "to quantify how big or small a given Learning Object should be.....because the appropriate definition of size depends on many factors such as: subject being covered, instructional design philosophy applied, and media tools being applied."

Another definition reads, "You can think of learning objects as knowledge granules created by specialists throughout an organization and that are accessible to many others in the organization." Clark breaks the term into two classes—1)information or knowledge objects and 2)instructional objects, where the first is the information needed to learn, and the second is the activity or practice exercise that reinforces the first. Learning objects share common characteristics based on the above definitions and current research.

INVALID GRAPHIC OR TEXT

The Use of Internet2-based Videoconferencing in Teacher Education

Betul Ozkan
Curriculum and Instruction Department
Iowa State University
United States of America
betul@iastate.edu

Clyciane Kossatz Michelini
Curriculum and Instruction Department
Iowa State University
United States of America
clyciane@iastate.edu

Abstract: Internet2 has a great potential for high quality videoconferencing. Although over 180 American universities collaborate with each other through Internet2, it is still a blurred concept for many teacher educators. In this study we have interviewed teacher educators who are using Internet2 in their teacher preparation courses, and asked them its pros and cons as well as their projections for K-12 schools.

In recent years one of the mo st popular terms in technological world is Internet2 even though many do not know what exactly it is and what it does or can do. "Internet2 is, basically, a collaboration of over 180 United States universities, teamed up with industry and government, to develop advanced Internet technology and applications for high-end academic experimenting and research" (CNet, 2001).

At the first sight, Internet2 looks very similar to the actual Internet: the data may be seen in a web browser and it is just a bigger pipeline to transfer data. However, Internet2 has some key qualities, which might have critical implications for instruction. It is *faster*, with data transfer rates in gigabits, and it is *more reliable*, because it has safeguards to make sure data packets are delivered. One important point we need to emphasize is that Internet2 uses Internet Protocol version 6 (IPv6) instead of current Internet Protocol (IPv4). The advantage of IPv6 is that it incorporates native multi-casting, high reliability and high capacity. It also allows applications requiring high bandwidth to coexist with each other simultaneously. These qualities also remind us requirements/needs of high quality Internet applications such as videoconfercncing systems.

Although Internet2 is only available to a restrict number of institutions, it is expected that the technology will be available to everyone in the near future. This means that the use of Internet2 will expand to schools, community colleges, museums and libraries giving the chance of streaming videoconferencing and other applications. These also means that adapting these applications to the needs of K-12 institutions will require some work, not only in technical or financial terms but pedagogical too. The International Society for

Technology in Education (ISTE), the Consortium for School Networking, and Educause are a few of the groups involved in several educational projects for Internet2.

Although Internet2 is a high-speed network primarily reserved for research institutions, there is a big need about its use in educational settings. In this study we have videotaped teacher educators from Center for Technology in Learning and Teaching (CTLT) at Iowa State University to illustrate its use at university level. Since the CTLT is being the leader of advanced technologies and their use in teacher education we have found it as a great opportunity to apply our study. The selected teacher educators of CTLT are primarily using Internet2 for videoconferencing with other universities to collaborate in research projects as well as to put together students from different universities to share knowledge and to collaborate in various courses' activities. These teacher educators are also using the Internet2 videoconferencing capabilities to share their expertise with other institutions as well as bring experts from other universities to their classroom environment. Their opinions about advantages and disadvantages of this powerful technology and their projections for K12 schools are also discussed.

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Higher Education and the Internet 2 Project: implications for educational practices

Roberto G. Pérez Galluccio
Florida State University
307 Stone Bldg.
Tallahassee, FL 32306
rgpg@technologist.com

Abstract: This short paper is geared towards those higher education professionals engaged in the design, development, implementation or management of internet-based resources and activities. The Internet 2 Project, a collaborative, cooperative effort carried out by higher education institutions in the United States, is set to revolutionize the way we look at educational communications and technologies. Current design constraints will change radically, forcing higher education professionals to redefine their practices, e.g., their web design strategies, as well as their use of the Internet. This paper provides a heads up on the potential offered, as well as the problems posed by, this cutting-edge technology.

Introduction

Those professionals in higher education who have been involved in the design, development, implementation or management of internet-based materials and activities, have surely more that once heard expressions like: "There's not enough bandwidth", or "The net is clogged", or simply "It can't be done". What's more, some of those professionals might have found themselves using those same expressions, when they tried to incorporate sound or even video to support teaching/learning experiences over the Internet.

Those times seem to be changing fast, mainly thanks to the Internet 2 project, the high speed, next generation academic network that is ready to boost multimedia applications delivered to remote locations.

The Internet 2

This project dates back to 1996, when a group of university and corporate researchers in America [1] started working full time in what has come to be known as the Internet 2 Project [2]. Members of the project have been doing what they know better: academics have been developing instructional content and applications, corporate members have been working on the software and hardware needed to support those applications.

The basis of the Internet 2 is its high speed -hundreds of times the actual speed- which will allow for the delivery of interactive, real-time instruction between remote computers; the sharing of digital (video, audio) libraries; the use of shared virtual reality environments, and every other research and learning activity professionals in the field may think of.

This is of special importance to the areas of web-based training and distance education, which are constantly increasing both in popularity and in technological advances.

The web-applications educators work with will then be delivered through the Abilene Network [3], the backbone of this new superhighway, that already runs from coast to coast in the United States, linking universities nationwide [4]. Unlike the current Internet, only academic and research centers can be part of this new network, which is seamlessly connected to the present-day Internet. This means that (a) both the current Internet and Internet 2 coexist and work together, but (b) only universities connected to the Abilene Network benefit from this high speed, and (c) only universities can create content for the Internet 2, making it a purely academic network (i.e. no e-commerce will exist there).

Those higher education professionals involved in distance education, for example, who have faced problems while working with multimedia applications delivered to remote locations, will now find that their technological constraints will be changed dramatically (in a positive way) by this new network.

Some problems

As far as the field of distance education is concerned, it is to be noted that distance learners at home will not benefit from this high speed. However, those attending classes at participating Internet 2 universities will be able to engage in collaborative, interactive activities that will overcome the limitations of audio and video broadcast over the current Internet.

There are, thus, some limitations for those outside campus, or in non-university settings: they will need to be on-campus if they want to take advantage of Internet 2. Also, for those universities outside the United States, the Internet 2 will not be available, until they create a local high-speed backbone (similar to Abilene), and connect it to similar backbones in other countries.

However, things are moving ahead quickly, and there are a number of Internet companies from around the world [5] already lined-up to work with the Internet 2 project.

Thus, as soon as the international academic world is interconnected, there will be real possibilities for distance educators in university settings to design and implement Internet 2-related teaching/learning experiences worldwide.

Conclusion

As professionals in the field of education committed to using new technologies to improve the quality and the effectiveness of our teaching activities, the Internet 2 has direct implications for us. The description of the Internet 2 project included in this paper, together with the reflections on its advantages and disadvantages, its potential and its shortcomings, acquire special importance given the constant development of Internet-based applications and technologies in recent years. It is to the advantage of higher education professionals to update their knowledge on the development of the Internet, so as to be able to redefine current strategies, methodologies and procedures when designing web-based instruction or Internet-based activities. Hopefully, this paper will serve as a trigger to motivate the reader to contact their local Internet 2 groups in their institutions, in order to get involved and take a proactive role in the use of this new medium.

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Teaching Teachers to Teach Internet Health

Frederik Tautz
ECC Online Relations GmbH
Germany
f.tautz@pobox.com

Abstract: Health-related websites are among the most frequently accessed resources on the Internet. Most young people have already researched the Internet for health matters, more than a third have even changed their behavior because of the information found. But, to some extent, the health contents on the Internet are misleading or even "quacky"– and chances are good that false information will prevail on the Internet: regulation or quality-checking of health-related contents is not very likely within the next few years. Therefore the assessment of quality is for now left to the individual. This paper is a call for action for teachers and offers practical advice on how teachers can start immunizing their students against misleading health information found on the Internet

Introduction to Young Online Health Seekers

For years now websites providing health information have been among the most frequently accessed Internet resources in the US (GVU 1998). Topics published on these websites cover every aspect of health ranging from anecdotal directions for a healthy life-style to well researched clinical guidelines. The information found on the Net not only influences people's health beliefs but also their medical decision making (for a more thorough discussion of this topic, see Tautz 2002). This behavior can also be seen in young online users as reported by a recent representative survey by the Kaiser Family Foundation (Kaiser 2001): About 90% of all young people aged 15-24 in the US are online today, 75% of them have already used the Internet to look up health-related information – compared to 60% of adults online (Pew 2001). What the young find on the Net appears very useful to them (39%, only 6% not so useful), and often so striking that they change their behavior on the basis of the information they have found online (39%). According to their answers young people get as much health information from the Internet as they get from friends or magazines. While parents, teachers and doctors are the primary and most respected sources for health-related information, many young people rely as much on Internet information as on knowledge obtained from peers or printed magazines. In addition young people say it is better to look up information on the Internet than to ask teachers (young online 58%: 41%, young online health seekers 63%:37%)and friends or to turn to the mass media. So "the time has clearly come to focus more attention on the role of the Internet as a health educator. Additional research (...) would be helpful, including the quality of online health information for young people ..." (Kaiser 2001).

The Quality Issue and a Possible Solution: The Informed Prosumer

As the Internet is a mass medium open to contribution from everyone without any peer-reviewing or independent editorial control, the quality of health-related information on the Internet is often doubtful (i.e. Pandolfini et al. 2000). An official body that effectively assesses the quality of online health information on a large scale is far from being realistic (Tautz 2002), the only ad hoc feasible way to protect people from the effects of bad information is to help the information-consumer to evolve to the stage of the informed prosumer. But to assess the quality of the information, consumers must have access to effective yet easy to use tools and must be educated to use these tools. As the Internet is now a tool as well as a teaching topic in most schools, teachers are in the best position to help young people to become informed prosumers. Teaching them to assess quality is one of the most important issues because: "[i]ncreased access to health information could create a more informed and healthful youth. On the other hand, if the quality of online information is not high or the source unknown, increased reliance on the Internet could lead to greater misinformation and skepticism." (Kaiser 2001). Teachers train their students to use the Internet. But do they train them to use its contents?

What Teachers can do to immunize Students against Misleading Health Information?

Make it a topic in class: General Internet classes , science classes or even English classes might be suitable for discussing the topic with your students. To introduce the topic i.e. in an *English class* you will find a service called "Hitting the Headlines" a valuable resource (http://www.nelh.nhs.uk/hth/archive.asp). This is a service provided by the The National Electronic Library for Health (which itself is a contribution by the British Health Authority). In "Hitting the Headlines" you will find summaries of health stories recently published in national newspapers together with a complete assessment of the story written by medical experts. Using the assessments you can demo nstrate how misleading information can develop "by accident" from simply making up a news story for lay media using medical information. For an *Internet* or *science class* you might want to introduce the topic by asking your students to do simple research on the Internet in order to advise parents how to deal with children's coughs. The same Internet research was done by medical experts who assessed the results for general quality, accuracy and reliability. As their method, the medical background and the findings are very well documented (see Pandolfini 2000; full text accessible online) you can just let your students take whatever they found on the Net and assess its quality by comparing it to the article.

Introduce the proper assessment tools: There are two top sources for obtaining information on assessing the quality of a medical website. One is the Health on the Net foundation (http://www.hon.ch), which offers a "Code of Conduct" for the provision of medical information on the web. The other – more practically oriented website is DISCERN (http://www.discern.co.uk) "Despite a rapid growth in the provision of consumer health information, the quality of the information remains variable. DISCERN is a brief questionnaire which provides users with a valid and reliable way of assessing the quality of written information on treatment choices for a health problem." (Discern 2002). Let your students review the commandments on www.hon.ch, let them use the DISCERN questionnaire to assess a good and a goofy website and then discuss the findings in class.

While using the DISCERN tool in class, proceed to *show examples of good resources and explain why they are good resources.* Of course the Internet offers plenty of high quality health information. You might want to show your students http://www.nlm.nih.gov/medlineplus/tutorials.html. The tutorials explaining a procedure or condition are a good starting point for demonstrating what the Internet has to offer in health-related information, as they stand out because of their very colorful and animated Flash-Movies. They are also very easy to understand.

Show examples of bad resources and highlight the intentions of the authors: A good starting point for choosing a "quacky" site to show to students is Stephen Barrett's website Quackwatch.com. This website "combat(s) health-related frauds, myths, fads, and fallacies (and provides) quackery-related information that is difficult or impossible to get elsewhere" (Barrett 2002).

Explain where to start researching for high quality health information: Let your students use Healthfinder (http://www.healthfinder.gov/) or MedHunt (http://www.hon.ch/) to research a given condition, let your students then use DISCERN to assess the articles they have found.

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Inspired by Inspiration

Leo Wells, Barat College of DePaul University, US

Inspiration: The Program

Inspiration was developed in 1999. It is a product of Inspiration Software Inc. A companion product, Kidspiration exists to allow lower grade students a much more visual and kid-friendly experience with the Inspiration concept.
I am using Inspiration for not only this submission, but also the outline for another paper at SITE this year.

Concept mapping with Inspiration as its model has been discussed in the literature already (Scappaticci,2000; Vojtek and Vojtek, 2000).

How Inspiration works

Inspiration is cross-platform, and works in Windows as early as version 3.1; Macintosh OS on Power PC with System 6.0.4 or higher. Inspiration is network compatible.

Fundamentally, Inspiration works in two contrasting modes. Diagram mode is where the "concept map" is best displayed. Ideas are literally "thrown" onto the screen and linked together. Outline mode literally makes a traditional outline of the concepts earlier shown on the diagram. The user moves back and forth between the modes, arranging and modifying the material for the user's purpose.

We have found that Inspiration works best with learners when there has been little formal instruction. Rather, the "learning by doing" method seems to work best for us in using this product with learners.

Inspiration: Audience

The Inspiration audience is generally assumed to be students. However, it can be effectively used wherever it is found. We are looking at SITE attendees that may not have the opportunity to use this type of software in their regular duties. Those that interface with K-12 educators and college-level trainers will be more likely to have had experience with Inspiration.

Educators

Educators can do a myriad of things with Inspiration, planning, mulling over ideas for lessons, preparing written reports, etc.

Students

Students can develop individual ideas, or work in cooperative groupings to plan or discuss ideas. Students in upper grades will be able to prepare, organize, and largely outline written assignments. The product Kidspiration will do similar functions for students in lower grades.

Everyone

Indeed, the uses for Inspiration seem to be endless. Anyone who needs to put ideas together can first put them in a visual form with Inspiration in its Diagram mode.

Session Objectives

We want all attendees, regardless of their role to experience Inspiration and discover the potential it can have for their own role in education, business, or whatever. No experience with Inspiration is expected or required. Indeed, we want attendees to enjoy this software and have fun with it.

Inspiration: Benefits

On the surface, Inspiration is a good organizer, but higher order thinking skills are also in play. Users can see how ideas are connected, construct ideas in a more meaningful way for the individual learner, discover how new knowledge can be integrated into the learning matrix, and find out how misconceptions can be more easily identified.

We would want to have three or four laptop computers with Inspiration already installed for session attendees to enjoy this fun and interesting software. We can provide these laptops if necessary.

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Technology Based Learning: Myth or Reality?

Dr. Michael Young
Cornerstone University, United States
myoung@cornerstone.edu

Dr. Michael Plaisent
Université du Québec à Montréal, Canada
Plaisent.michel@uqam.ca

Dr. Prosper Bernard
University Consortium of the Americas, United States & Canada
Prosper1@compuserve.com

Abstract: This paper questions the robustness of empirical evidence regarding technology's ability to promote increased learning. The use of a new technology, by itself, does not seem to increase student learning. Most evaluation research has found that learning can take place with any technology-based medium. However, the literature has shown a significant interaction between instructional approach and student learning style. The introduction of educational technology into the classroom likely affects the patterns in the relationships among variables associated with teaching and learning.

Technology Based Learning

Not long ago, an educator asked to name the tools of technology based learning, would perhaps suggest chalk, a mimeograph machine to cut stencils for handouts, or transparences and an overhead projector. Now, because of the rapid rate of technology improvement, the toolkit is so much fuller. The use of the term educational technology is often less than precise. Thompson, Simonson, and Hargrave (1992) placed educational technology research into five categories which include: (1) evaluation research, (2) media-comparison studies, (3) intra-medium studies, (4) aptitude-treatment interaction studies and (5) alternative research designs. Evaluation research concerns itself primarily in testing the extent to which student learning is impacted by a new medium. Most evaluation research has found that learning may take place with any technology-based medium. In contrast, media-comparison studies compare one type of medium to another or to conventional instruction to determine impact on student learning. These studies, however, have been mired in controversy since the early 1980s when it was suggested that media were mere vehicles that deliver instruction without influence on student achievement.

Ester (Winter94/95) has demonstrated that computer-assisted instruction (CAI) may improve achievement and student attitudes while decreasing instructional time. Ester was, however, concerned about a possible discriminatory effect of CAI on students with different learning styles. He conducted empirical research seeking to determine if student learning style interacted with CAI, and found a significant interaction between instructional approach and student learning style. In effect, abstract learners demonstrated significantly higher achievement with the lecture approach, while concrete learners performed equally well with lecture and CAI.

The literature suggests that student learning styles vary with: (1) age, (2) achievement level, (3) culture and (4) global versus analytic processing. In addition, learning styles have been found to vary within the family. First-born children tend to reveal characteristics of one of their parents while second-born children often evidence characteristics of the other parent. In contrast, the third-born child has a style very different from both older siblings. Several different learning style definitions and inventories have been developed. For example Grasha and Yangarber-Hicks (2000) defined learning styles as the preferences students have for thinking, relative to others and particular types of classroom environments and experiences and created a model of teaching styles used in the classroom which include: (1) expert, (2) formal authority, (3) personal model, (4) facilitator and (5) delegator. The expert style takes the attitude that "facts, concepts, and principles are the most important things that students can acquire" (Grasha, 1994, p. 19). Formal authority says "I set high standards in this class" (p. 19). Their personal model suggests that "what I say and do models appropriate ways for students to think about content issues" (p. 19). The facilitator adopts the notion that "small group discussions are employed to help students develop their ability to think critically" (p. 19), while the delegator says that "students in this course engage in self-initiated self-directed learning experiences" (p. 20).

Grasha and Yangarber-Hicks (2000) empirically studied the notion that the teaching style of the instructor should be adapted to fit with the learning style of the student. The authors suggest that faculty members need to think about how technology fits into their philosophy of both teaching and learning. While they found that the effect of the introduction of technology on teaching style, learning style, grades obtained and course satisfaction was not robust, the effects of the absence of technology could be observed. Therefore, the introduction of educational technology into the classroom likely affects the patterns in the relationships among variables associated with teaching and learning. Other studies suggest four strategies to develop the compatibility of teaching and learning styles using technology. These strategies suggest an alignment of teaching styles which reinforce specific student learning styles in conjunction with the use of technology. The first strategy uses the expert and formal authority teaching styles to reinforce dependent, participant and competitive learning styles. The second strategy uses the personal model, expert and formal authority teaching styles to reinforce dependent, participant and collaborative learning styles. The third strategy uses the facilitator, personal model and expert teaching styles to reinforce independent, participant and collaborative learning styles. Here, faculty create activities, facilitate interactions and direct instructional processes with a plan to encourage active learning. The fourth strategy uses the delegator, expert and facilitator teaching styles to reinforce independent, participant and collaborative learning styles. Here, the faculty member adopts the role of consultant to students.

Conclusion

Critics may provide a useful service in providing a healthy skepticism about the potential of technology in the classroom. Empirical evidence regarding technology's ability to promote increased learning is not robust. The use of a new technology, by itself, does not seem to increase student learning. According to Neal, (1998) those who promote technology often emphasizes the delivery of instruction, rather than improved learning for students. In fact, technology often leads to less face-to-face contact among teachers and students, which may result in the promotion of an impersonal atmosphere.

Most evaluation research has found that learning can take place with any technology-based medium The literature has shown a significant interaction between instructional approach and student learning style. The introduction of instructional technology into the classroom likely affects the patterns in the relationships among variables associated with teaching and learning. In addition the notion of using educational technology to tailor the faculty member teaching style to fit that of the student learning style may be useful. More research needs to be done in this area.

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