A WEB-BASED APPROACH TO THE DELIVERY OF INSTRUCTION ON INFORMATION AND COMMUNICATION TECHNOLOGY

P. W. Wright

ABSTRACT
While web-based courses are not new they are in their infancy. Courses that employ web-based technology to teach about technology are even less common and are attended by a unique set of challenges and intricacies. This paper describes a web-based course called Technology Tools for Teaching and Learning. Something that makes this course particularly interesting is that, while it is accessible remotely, it is essentially taught on-campus, via alternative delivery.

INTRODUCTION

By far the most significant advances in Information and Communication Technology (ICT) in the last decade have occurred in the area of telecommunications and networking - especially in the evolution of the Internet. Educators have been quick to spot the potential of the Internet and the World Wide Web (WWW) in particular. The powerful combination of computers and the Internet has greatly increased the prospect that ICT will have a revolutionary impact on teaching and learning (a promise that was once thought to be realizable by microcomputers alone). At the very least it is fair to say that the WWW has redefined the notion of alternative delivery.

When microcomputers were introduced into education, a great deal of attention was directed at describing the various modes in which they could be used. This activity led to terms such as CAI (Computer-Assisted Instruction), CBL (Computer-Based Learning) and a host of others. The same kind of attention has recently been directed at categorizing the way that the Internet (including the WWW) can be employed (see Khan, 2000 for example). A term which has gained significant acceptance and which most appropriately characterizes the course described in this paper is web-based learning. With web-based learning, a web site is the primary resource. The implication is that learners can complete a course with minimal interaction with an instructor. Some observers will identify a variation of web-based learning, notably, web-mediated learning.

With web-mediated learning, the web site is still the key resource but instructors assume a more prominent role (than in web-based learning).

While web-based courses are not new they are certainly in their infancy. Courses that employ web-based technology to teach about technology are less common and tend to amplify the challenges and intricacies associated with the approach. This presentation will describe experiences with a web-based course called Technology Tools for Teaching and Learning. Something that makes this course particularly interesting is that, while it is accessible remotely, it is essentially taught on-campus via alternative delivery.

TECHNOLOGY TOOLS FOR TEACHING AND LEARNING – THE COURSE

The context for the use of ICT in education is changing dramatically and initiatives are under way to ensure that the technological literacy of students will not be left to chance. In an article that polled several experts and stakeholders on their vision of the future of technology education, John Ritz (2000) states that "by 2010, technology education will be the new basic. It will become the fifth core of the school curriculum". In the Province of Alberta, Canada, 2010 is now. Beginning in September 2000 a new program of studies called Information and Communication Technology became mandatory for all students in Kindergarten to Grade 12 – the fifth core subject. Similar initiatives are evident in the US where ICT standards have been defined for both students and teachers (The National Educational Technology Standards for Students, 1998 and the National Educational Technology Standards for Teachers, 2000).

In the Alberta initiative, learner outcomes in ICT have been defined and organized according to three major categories (see Wright, 1999) notably;

1) Foundational Operations, Knowledge and Concepts
2) Processes for Productivity
3) Inquiring, Decision-making and Problem-solving

Defining characteristics of the program are that it is mandatory, its goals and objectives are distributed across all grades and subjects, and integration is paramount. The ultimate goal of the program is to emphasize technology as an approach to problem solving, a way of thinking, a process as opposed to merely a tool. With the current emphasis on technological literacy in schools it is even more important that teacher education programmes prepare prospective teachers in the use of ICT.

Technology Tools for Teaching and Learning is a web-based course (henceforth referred to as the course) which provides education students with an opportunity to acquire the knowledge and skills necessary to address the learner outcomes. The course is targeted at after degree students – it contains six modules each of which incorporates a number of assignments. Before beginning the modules, students are asked to choose a theme that relates to their area of teaching expertise and interest and which is reflected in the Alberta curriculum. The first three modules of the

course focus on the development of the skills necessary for the acquisition and development of resources that will subsequently be used in three major theme-based projects. The six modules are briefly described below.

Module 1 - Internet tools

The four major topics covered in this module are the Internet, file transfer, email, and (web) conferencing. In the Internet unit, students become familiar with the use of a variety of search tools and then use these tools to seek out and acquire information that relates to their course theme. In the process, they learn how to capture text, graphics, sound, and video from both the foreground and background of web pages. As well, students learn how to create and edit a bookmark file which they subsequently transfer to a password-protected 25 Mb file space reserved for their use on one of the University's General Purpose Unix (GPU) fileservers.

Before beginning the email component, students are taught how to use a Telnet application to establish a GPU session during which they change their password. Students learn how to establish their email presence including all preference settings and then learn the basics of email interactions including the establishment of address books and groups. Students use their knowledge of email and attachments to submit both their theme and the outcome of their early Internet search for the purpose of evaluation. The use of listservs is also included in this section.

In the web conferencing unit, students are required to log on to a conference board, introduce themselves to the class, and share their theme and topic with their peers. Other conferences are established and students are encouraged to use these to interact and collaborate with each other. Close to the end of Module 1, the notion of file transfer is revisited and students transfer their bookmark file to the publicly accessible part of their GPU space. The establishment of file permissions is also addressed at this time.

Tools used in Module 1 include Netscape, NCSA Telnet, Fetch, Eudora, and WebBoard.

Module 2 - Multimedia tools

This module deals with the capture, conversion, editing, and formatting of graphics, sound, and video. There are seven components in this module. In component one, students learn how to access and use clip art. In component two, they are required to become familiar with at least one graphics tool and to produce an original (not necessarily sophisticated) graphic. Component three features the use of the scanner and component four the use of a digital camera. Components five and six deal with audio information including the capture of sound from a microphone (typically, a narration) and a CD as well as the use of sound editing tools and techniques. Component seven deals with by far the most challenging and sophisticated part of the module - the conversion of video information from analog to digital format.

After students have captured/converted their video clip they are taught how to edit it including the use of title screens, transitions, and the dubbing of sound. Students are encouraged to use media that can be incorporated in their upcoming projects if possible. Typically, however, this

does not happen because their theme-related planning is not sufficiently advanced at this point in the course. This is actually a good thing since it causes them to revisit and reinforce the techniques that they have learned. In Module 2, students learn about common file formats and the extensions that are associated with them as well as file compression and conversion techniques. Tools used in Module 2 include Adobe Photoshop, various clip art sources (e.g., Corel Clip Art Gallery), QuickTime, Macromedia Sound Edit, Adobe Premiere, various graphic conversion utilities, a digital camera, and a scanner.

Module 3 – Spreadsheet and database

The spreadsheet and database module seems almost out of character with the course - it is, however, one of the most critical elements if judged in terms of its relevance to the learner outcomes in technology referred to previously. In this module students learn the basics of spreadsheets and databases. The treatment of the spreadsheet covers the use of basic functions such as Average, Count, Max, and Min and extends as far as the use of "the logical if". Students are required to build a spreadsheet that simulates the calculation of a course final mark based on three progressively more complex sets of criteria. In the database area, students are required to format a database and then develop reports which interrogate it according to criteria involving the use of "and" and "or". All aspects of formatting are addressed. Attention to charts and graphs is optional but recommended. The software used for this module is Excel.

Module 4 – On-line presentation

This module prepares students to complete the first of three major projects.

Typically, PowerPoint is used for conventional presentations in which slides (containing information in point form) are presented in a linear sequence. In this course, however, students are encouraged to view PowerPoint as a more general presentation tool that can be used to create a self-contained information resource. They are required to develop a presentation that not only focuses on a topic in the Alberta programme of studies but which presents that topic in a manner appropriate to a specific grade level in the kindergarten to grade twelve school system.

After first becoming familiar with PowerPoint, the students develop a presentation that reflects their chosen curricular theme and consists of at least fifteen slides. In addition to including the multimedia elements developed in Module 2 (e.g., graphics, sound, and digital video) students are encouraged to explore and demonstrate the more sophisticated use of PowerPoint through the use of such features as "Action Buttons" and "Custom Animation". Typically, students use these features to; create building slides, create links to web sites, launch other applications, and to manage the presentation of the various multimedia elements. Students also learn how to use Action Buttons and hyperlinks to create easily navigable non-linear presentations. Some time is also spent on the establishment and use of "Master Slides" as well as on slide show presentation techniques (e.g., narration and automatic slide timing).

Module 5 – Hypermedia construction

This module parallels the objectives for the electronic presentations module but uses a popular hypermedia application called Hyperstudio. Unlike PowerPoint, Hyperstudio was designed with young learners in mind. Students are again required to create a multimedia presentation that incorporates the digital elements created in Module 2. As well, they are encouraged to explore and use advanced features such as "New Button Actions". This Module places greater emphasis on navigation and the use of hyperlinks.

Students are encouraged to compare and contrast the hypermedia and presentation software applications.

Module 6 – Web site creation
This is the most sophisticated of the three major projects. Students develop a substantial, multi-page web site without the use of WYSIWYG (**W**hat **Y**ou **S**ee **I**s **W**hat **Y**ou **G**et) web site authoring tools. The web sites developed feature the use of all common elements including graphics and embedded audio and video and draws upon those multimedia elements that were developed in Module 2. As was the case for the presentation and hypermedia modules, the intent is for the web site to reflect the student's curricular theme. In developing the web site, students acquire a significant working knowledge of **H**yper**T**ext **M**arkup **L**anguage (HTML) tags and coding techniques including the use of relative and external links and the use of tables. While students are not permitted to use sophisticated WYSIWYG tools, they are encouraged to use an aid to editing called World Wide Web Weaver. This relatively simple tool facilitates the establishment of appropriate syntax for higher level coding. Students learn the distinctions between "made from scratch" and "save as HTML" documents, the latter of which typically contain metacode.

In Module 6, students are required to develop a web-accessible version of their PowerPoint presentation and to link this to their web site. As well, they are required to establish relative links between their web site and the bookmark file that was created in Module 1. Finally, students revisit the file transfer techniques covered in Module 1 and post their web site to their publicly accessible GPU space for the world to see.

SOME OBSERVATIONS ON WEB-BASED DELIVERY

The "Technology Tools for Teaching and Learning" course consists of thirty-six hours of instruction and thirty-six hours of laboratory experience. Formally, the course takes place in a computer lab and is scheduled as two three-hour blocks per week for a twelve-week period. The first half of each class is considered to be "lecture" time while the second half is considered to be lab time. The course, which can be pursued either offsite or onsite, reflects the web-mediated mode of delivery. Despite the fact that the course can be pursued offsite most students attend most classes. Typically, the instructor provides a brief presentation/demonstration at the beginning of each class after which students can turn to the comprehensive course web site to explore the modules and the extensive online resources that are available.

Regardless of the approach, with any form of web-based delivery both the role of the student and the instructor change. The instructor must actively and frequently encourage students to use the site - this almost has to be a mission. This is particularly true while web-based learning is in its infancy because students are not likely to be familiar with the approach. Very frequently when addressing a student question the instructor's first response will be "did you look on the web site". There is the very real risk that students will interpret such a response as being either obstructive or an indication that the instructor does not have the answer. One way to ameliorate this situation is to discuss the nature of online learning at the beginning of the course.

An instructor needs to be acutely aware that, because the whole course is available at the outset, students will very quickly be working at different places in the course. This of course is one of key the goals of web-based delivery - self-paced (independent) learning. While this seems obvious it can still take an instructor by surprise. The implications of this circumstance are particularly apparent in a course whose content is technology because many of the questions that students pose relate to seemingly small technical details. Those small technical details, however, can confound since technology tends to treat the user as being one hundred percent wrong unless s/he is one hundred percent (technically and syntactically) correct. The remedy for this is for the instructor to be prepared in all course content at the outset and/or to become comfortable "looking things up on the fly".

Because of the lack of face-to-face contact implied by web-based learning there needs to be an effective, alternative means of communication. The most natural mode for this is some form of electronic communication, typically a conferencing system or email. Experience shows that students will ask more questions in this situation. In part this is inherently due to the lack of face-to-face contact but it has also been associated with the anonymity that electronic communication affords. Web-based learning allows students to access a course from home (or any other location that affords Internet access) and at their convenience thereby realizing a second major goal of alternative delivery, time and place independent learning. Without a doubt, web-based delivery leads to greatly increased email contact - this is particularly true if students are offsite. The establishment of conference boards and email lists for class use can, in theory, reduce direct email contact. Students often request that email messages be sent to an unconfirmed or third party address. To ensure confidentiality and security, all course-related email is sent to the university-assigned email address. Students are advised that they can redirect their email.

With a web-based course on technology it is more likely that the learner will have several applications (and windows) open at any point in time. For example, a student working on the development of a web page is likely to have at least three applications open simultaneously such as the web browser, the HTML file (via the editing tool or word processor) and the related online tutorial. Clearly, there needs to be enough memory to cope with this situation. The learners in the web-based technology course need to know how to allocate Random Access Memory (RAM) to applications, not only to be able to accomplish a single task but to accommodate the simultaneous use of applications. In some situations, learners may also be required to establish Virtual Memory (VM) parameters. The course described here requires the use of at least twenty

software applications/tools. The greater the number of applications in simultaneous use the more likely an unfathomable conflict will occur. In extreme cases, conflicts can cause the computer to crash with subsequent loss of data and/or network connections.

The administration of a web-based course on technology implies a number of tasks and challenges that are not typical of conventional approaches. For example, while the course outline is likely to be an integral part of the course web site, it is still common for institutions to require that it also be made available in hard copy format. Merely printing from the web site does not always address the need. Many web sites incorporate a "course news and announcements" feature. If this is the case it is important to keep this component up-to-date. Sometimes there are no new announcements - this can create the false impression that the web site is not current. This impression can be countered by the common practice of incorporating a "last updated" indicator. These two examples may not seem to be very significant but they are indicative of the increased expectations (and related overhead) that accompany web-based delivery. Special attention must be paid to the technological environment that supports web-based delivery particularly in relation to browser compatibility and its ability to support the use of multimedia (e.g., plug-ins, preference settings).

Web-based instruction can increase the sophistication of instructional delivery. With this increased sophistication comes increased complexity and potential dependencies that would not otherwise be present. For example, in the course described above it is necessary to maintain effective relationships with several categories of resource people. These include the technical resource personnel who establish and maintain the basic instructional environment (including the local area network), the department of Computing and Network Services staff that manage the publicly accessible network (including the GPU system, email accounts etc.), and a web conferencing administrator. If a course instructor does not have both the expertise and authorization to make changes to the web site there will be a critical dependency on someone who does (a web master or designate).

Overall, web-based delivery requires a very heavy up-front investment (to develop the web site); it also implies significant maintenance. The more resource rich the site the greater the investment in both development and maintenance. These aspects are more pronounced for courses that focus on technology and/or that depend significantly on access to other Internet resources.

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Peter W. Wright, Ph.D.
Professor
Department of Educational Psychology
Faculty of Education
University of Alberta
Edmonton
Alberta
Canada
T6G 2G5
Tel: (780) 492 5363
E-mail: peter.wright@ualberta.ca