

AN INTERACTIVE WEB-BASED RADIATION PROTECTION COURSE IN FLUOROSCOPY

J. Aldrich

Department of Radiology, The Vancouver Hospital, Vancouver, Canada

Abstract

The teaching of radiation protection to a large group of physicians, who are separated geographically and have complicated schedules, is a formidable problem. Therefore a web-based solution is attractive, allowing access to the material at any time and place. In this implementation the didactic material is presented in a web-based format. Subsequently, students attend a practical demonstration in one of the departments' fluoroscopy rooms. Because of local experience with distance education, WebCT was chosen to present the material. WebCT (Web Course Tools) was developed by the University of British Columbia (UBC) to allow educators, with or without technical expertise, to create sophisticated web-based courses. Authors use a standard Web browser to create courses, and students use their browsers to access course material. WebCT provides a wide variety of tools and features that can be added to a course. Among the most useful tools used in this fluoroscopy course are the glossary, multiple-choice questions for each section, and a final test which is scored by the computer. As with all Web-based material the courses can be viewed in the traditional linear fashion or in any random way through the use of linkages.

1. Introduction

The World-Wide-Web Course Tools (WebCT) has been developed by UBC over the last few years and presents an environment that allows educators to create sophisticated web-based courses. These courses can incorporate a large number of tools and features. Furthermore, the interface to WebCT (the interface that is used by the educator to build a course) is entirely web-based. This has many advantages including simplicity and platform-independence. Using Web-CT requires that a course-author connect, using a browser such as Netscape, to a WebCT site. The site is simply an http server that serves the WebCT pages and CGI scripts.

2. What does a WebCT "course" look like?

The content of a course is provided by the course designer. Structure, interactivity, and educational tools are provided by WebCT. WebCT also allows the designer to alter the look of the course by, for example, selecting from existing (or creating custom) colour schemes, choosing between *formal* and *informal* button sets, incorporating custom or WebCT built-in banners, and so on.

3. Main course homepage and tool pages

A course developed using WebCT is organised around one main homepage. This homepage is the entry point for the course (the first page that designers and students see after having logged on to the course). It can contain, among other things, a banner image, a textual message, links to *course content elements* (notes and assignments, for example), and links to *course tools*.

While there is only one main homepage, there can be any number of subsidiary homepages (called *tool pages*). A tool page behaves exactly like the main homepage, except it is not reached immediately on entering the course. Instead, a tool page is reached by clicking an icon on the homepage, or another tool page. Thus the homepage and tool pages can form a hierarchy of pages with the main homepage as the root.

4. Course content

WebCT provides a structure around which one can build a course. If you already have your notes in a word processor it is fairly straightforward to modify the material. The course needs to be broken into short sections, say two screens long, so that the students do not have to scroll too much. Each section is then saved in html format which is required for WebCT. Many word processors also convert images to GIF format. Otherwise the html editor in your word processor should allow you to incorporate links to other types of image format such as JPEG, which is most commonly used for x-ray images.

Once you have your course material in html format you can create a complete interactive course using only the tools provided by WebCT. When you log in to WebCT using a web browser (the system is optimised for Netscape) you can do so as the designer or as a student, naturally with different passwords. As a designer you have access to all designer facilities, such as file management, page design, on-line editing, indexing, glossary definitions, and a whole range of tools for student exams, marking and reporting.

Normally to create a course the files are uploaded using the file management facility, and then arranged in a suitable order or *path*. Each page in the course can then be customised to suit the author. Glossary terms to explain new terms can be useful, and multiple choice questions are easy to add. These MCQs are for self-assessment not final exams which are explained later. On any page an index term can be defined and this will be automatically integrated into the course index. Although this does not seem important initially, as the number of courses and pages grow an index becomes vital.

5. What is a course tool?

A course tool is a feature supplied by WebCT that can be incorporated into any course. Tools can be made accessible (through a clickable icon) from the main course homepage, tool pages, or from content page button bars. Examples of tools include a conferencing system, timed quiz delivery, on-line marking, grade storage and distribution, e-mail between course participants, searchable image archives (both shared and private to a course), student self-evaluation, student presentation areas (both individual and group), student annotation facility, student progress tracking, course glossary and index, and more.

6. Navigation

When students log on to the course, they are presented with the main home page. If they had ever been signed on before, WebCT can take them to the page of content they were at when they ended their previous session (using the "resume session" tool). Otherwise they can click on a path icon (perhaps the main set of notes), a tool page icon, or any other icon available on the homepage.

Once they are on a page of content, included in the button bar are navigation arrows that will take them to the previous or next page of notes in the path. If they ever stray off the path,

perhaps to view an off-site URL, a single click returns them to the point from which they left the path. This avoids the reorientation otherwise necessary after a prolonged foray off the path. The navigation buttons also allow the student to go directly to the homepage, to retrace through the last few accesses, or to view the hierarchy of the current path for direct access to any page on that path. Also, the status bar at the bottom of the browser always displays the name of the path the student is on, and the page number currently being viewed.

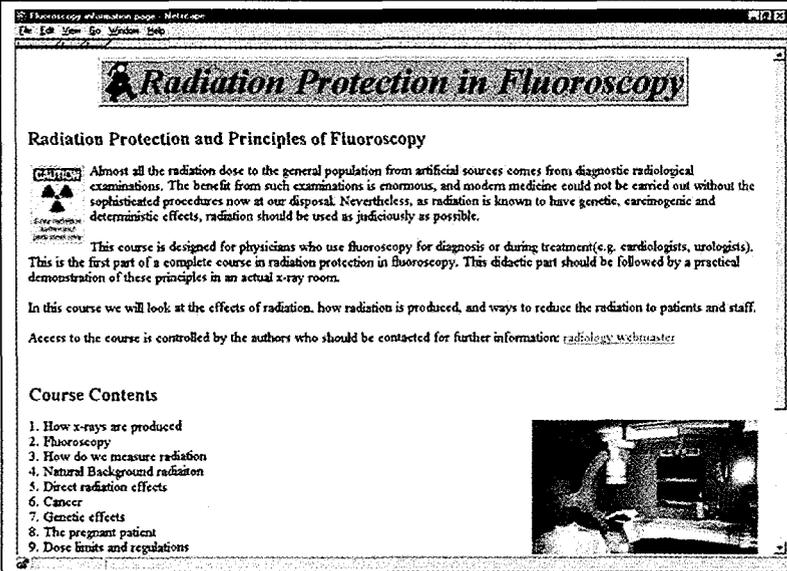
Finally, the button bar on each page of content provides direct access to any course tool that has been included on that page by the designer. These might include links to that page's multiple-choice questions, a link to a conference forum for that page of notes, or a link to reference material for that page.

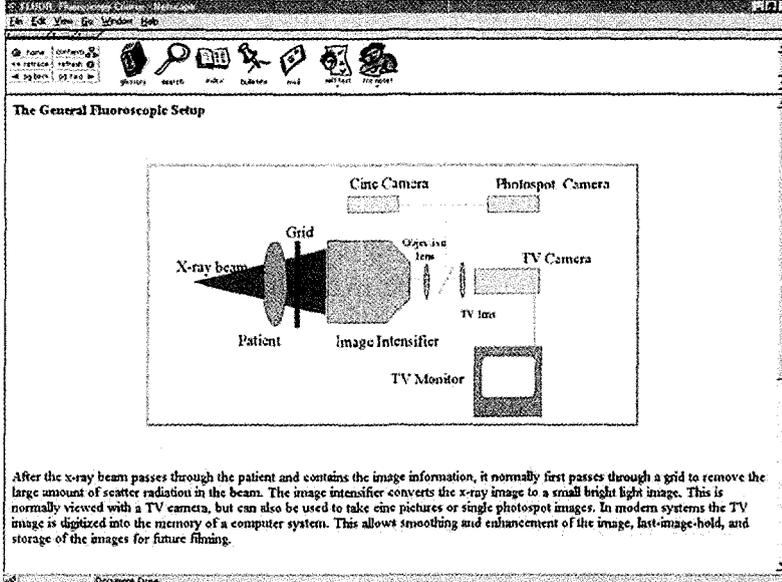
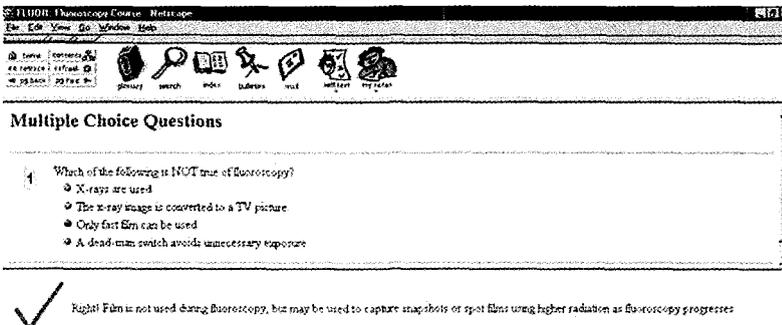
7. Tests and exams

On each page multiple choice type questions can be added to help the student understand the material. These questions are not used in the assessment of the student. Complete examinations can also be given via WebCT. Examination date, time and length are set on the system. Questions can be of many types. Multiple choice, true-false and simple word answers can be marked on-line. Short answer and essay type questions have to be marked by the examiner. The students can access their marks on-line.

8. Fluoroscopy course

Typical screen captures from our fluoroscopy course are shown below.

	<p>The first screen is the page, which anyone can access on the internet, gives information about the course.</p> <p>To log on students need an ID and password. This enables monitoring of student progress and identifies students who take the final test.</p> <p>Next is the screen, which a student sees after logging onto the course.</p>
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<div style="text-align: center;">  <h2 style="margin: 10px 0;">Fluoroscopy Course</h2> <p style="margin: 5px 0;"><i>A Practical Introduction to Safety in the Use of Radiation in Medical Diagnosis</i></p> <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;">  <p>Fluoroscopy Course</p> </div> <div style="text-align: center;">  <p>resources</p> </div> <div style="text-align: center;">  <p>record</p> </div> <div style="text-align: center;">  <p>Course Final Quiz</p> </div> </div> <p style="text-align: center; margin-top: 20px;">This page has been accessed 00005 times.</p> </div>	<p>From here the student can start the course or take the final test. At the beginning of each course a list of all the sections is seen as below. The counter can be reset at the start of each course to give an overall picture of student access. For the course instructor much more detailed information on what pages are read and for how long are available if necessary. As well as sometimes verifying that the material is actually read, this information can help to identify difficult sections of the course.</p>
 <p>The diagram shows the components of a fluoroscopic setup: X-ray beam, Patient, Grid, Image Intensifier, Cine Camera, Photospot Camera, Open lead lens, TV Camera, TV lens, and TV Monitor. The X-ray beam passes through the patient and grid, then through the image intensifier. The image intensifier is connected to a TV camera, which is connected to a TV monitor. The image intensifier also has connections to a cine camera and a photospot camera.</p> <p>After the x-ray beam passes through the patient and contains the image information, it normally first passes through a grid to remove the large amount of scatter radiation in the beam. The image intensifier converts the x-ray image to a small bright light image. This is normally viewed with a TV camera, but can also be used to take cine pictures or single photospot images. In modern systems the TV image is digitized into the memory of a computer system. This allows smoothing and enhancement of the image, last-image-hold, and storage of the images for future filming.</p>	<p>This shows a typical interactive page. The top bar shows the navigation tools, which enable the student to go through the course page by page or return to the contents page or the home page. Alongside the navigation tools are special tools which enable the student to access the glossary, index, bulletins from the instructor, mail from the instructor or other students, the self-test quiz, and private notes that the student can attach to any page. Terms in the glossary are highlighted in red in the text.</p>
 <p>Multiple Choice Questions</p> <p>1. Which of the following is NOT true of fluoroscopy?</p> <ul style="list-style-type: none"> <input type="radio"/> X-rays are used <input type="radio"/> The x-ray image is converted to a TV picture <input type="radio"/> Only fast film can be used <input type="radio"/> A dead-man switch avoids unnecessary exposure <p><input checked="" type="checkbox"/> Right! Film is not used during fluoroscopy, but may be used to capture snapshots or spot films using higher radiation as fluoroscopy progresses</p>	<p>One of the questions from the self-test quiz for this page is shown at left. This question mode is designed for self-evaluation as the student progresses through the material. By selecting any answer, correct or incorrect, feedback is given about the reasons for the answer.</p>

We have also used WebCT as the basis of our undergraduate teaching modules in radiology. This is one of the most demanding areas of teaching because of the number and quality of diagnostic images needed. This distance learning package seems well accepted and suitable for instruction where geographic and scheduling constraints would impede normal lectures.

Further information can be found at our website at <http://web.ucs.ubc.ca/aldrich/home.htm>. and from <http://www.webct.com>.