Athabasca University Master of Arts - Integrated Studies

ON MAKING LEARNING OBJECTS INTO EDUCATIONAL WEB PAGES: APPLICATION TO TEACHING CLINICAL AIRWAY MANAGEMENT

By

D. JOHN DOYLE

Integrated Studies Project

submitted to Dr. Terry Anderson

in partial fulfillment of the requirements for the degree of

Master of Arts – Integrated Studies

Athabasca, Alberta

August 17, 2007

My MAIS 701 /702 project was entitled "Development of a Medical Education Web Site on Clinical Airway Management: An Application of Digital Learning Objects." In this report I will be commenting on my experiences in carrying out this project, reflecting on what I learned, on the challenges and difficulties encountered, and on what I would do differently it I had to do it over again. Suggestions for further work are also discussed.

Outline

- Introduction
- Needs Analysis
- Web Page Development - Theory
- Digital Learning Objects
- Definitions and Taxonomy
- Challenges with Learning Objects
- Content Development
- Web Page Development – Practice
- Revisions
- What I Would do Differently Next Time
- Ideas for Future Work

List of Figures

List of Tables

Introduction

Clinical airway management is one of the cornerstones of acute care medicine and as such is important to emergency room physicians, anesthesiologists, paramedics and many other health care providers. In recent years there has been a virtual explosion of new information in the field of clinical airway management, with new algorithms, new technologies and new procedures being described in the medical literature or promoted by medical societies. This enormous growth in information, however, has lead to problems in making this information available to clinical practitioners in a form that is useful to them. Fortunately, because of the Web, access to medical information resources throughout the world has never been greater or easier. There is thus an ongoing need for making thus new information available via the Web. The MAIS project I undertook was aimed at addressing this challenge.

From the onset of the project one goal was to provide information in a format that is clear, succinct, and definitive, and offering generous use of graphical illustrations and summary tables. I also thought that it might be potentially beneficial if the resources provided were also available as “digital learning objects”, a concept that has remains of considerable interest in educational technology circles and is one of the foci of this project.

Needs Analysis

The start of the project began several years ago with a perception that there was a need for a readily accessible high-quality Web-based resource on clinical airway management. This issue arose on a number of occasions at the annual meetings of the Board of Directors of the Society for Airway Management, where it was repeatedly suggested that, of the various methods of education available, the use of the Web offered special promise in terms of wide accessibility and low cost, especially compared to more traditional methods of physician education such as maintaining a speakers bureau, producing educational videos for distribution as DVDs or VHS cassettes, or producing and distributing glossy brochures.

A number of formal needs assessment survey instruments were considered for the project (e.g., surveying people at medical conferences, using a postal survey, using an Internet-based survey). However, although the technology associated with conducting such a survey may be easier than ever (especially with the advent of Web-based survey systems such as www.surveymonkey.com), regulatory barriers were identified that were potentially problematic, such as the need for institutional approval by an ethics committee, with its associated bureaucracy.

As a result, it was decided to rely solely on informal methods for conducting the needs analysis, using methods such as conducting a Medline search of the medical literature (www.pubmed.gov), conducting informal discussion with colleagues and residents, as well as conducting informal discussion with nationally recognized experts.

Web Page Development - Theory

For some time I have been interested in using Web-based methods for educational purposes, and especially for medical education. Web pages are a particularly useful means of providing information of almost any kind. They are easily accessed and relatively easily updated. Linkages to other documents are easily provided, and support for tables, graphics and even multimedia features like audio and video can be built in without enormous training and expertise. While my early efforts in Web page development were relatively primitive undertakings based on hand-coding in the HTML language, I soon found myself exploring a variety of software packages to make the task easier.

Over time I tried out and mastered Netscape Composer, Microsoft FrontPage, Net Objects Fusion and several other less known packages available as shareware. Later, when I tried out Macromedia Dreamweaver it eventually became apparent that the richness and complexity of the latest professional packages were unsuitable for dilettantes like me – their steep learning curve left

me focusing more on the software than on the content I wanted to show to the world. In due course I came to learn and love a less well-known Web page development system known as Homestead (www.homestead.com). It is reasonably powerful, yet is particularly easy to use. As a result I ended up using it for this project and for numerous others (see Figures 1 and 2). Examples of previous educational projects I have carried out using the Homestead system include:

- http://anesthesiapatientguide.homestead.com
- http://blackdeath.homestead.com
- http://codebluestory.homestead.com
- http://differentialdiagnosis.homestead.com
- http://glidescope.homestead.com
- http://ctrach.homestead.com
- http://medicalsimulation.homestead.com/

From the onset of the project, consideration was given to the use of appropriate design principles for the Web page construction, so as to avoid a garish result. In this respect, Table 1 on the next page (from one of my reports for the MAIS 701 portion of the project) lists some of the more common design pitfalls I sought to avoid in my design. I also took guidance for a marvelous (but dated) book by Flanders and Willis entitled “Web Pages That Suck: Learn Good Design by Looking at Bad Design” (Flanders and Willis, 1998).

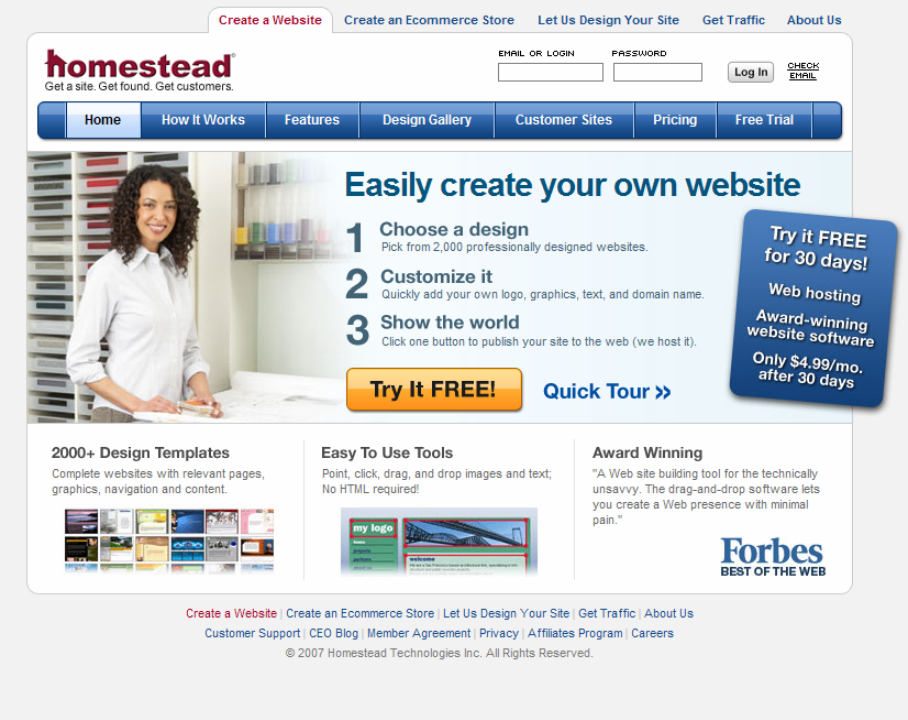

Figure 1. The opening page at www.homestead.com, the Web site development system used in this project.

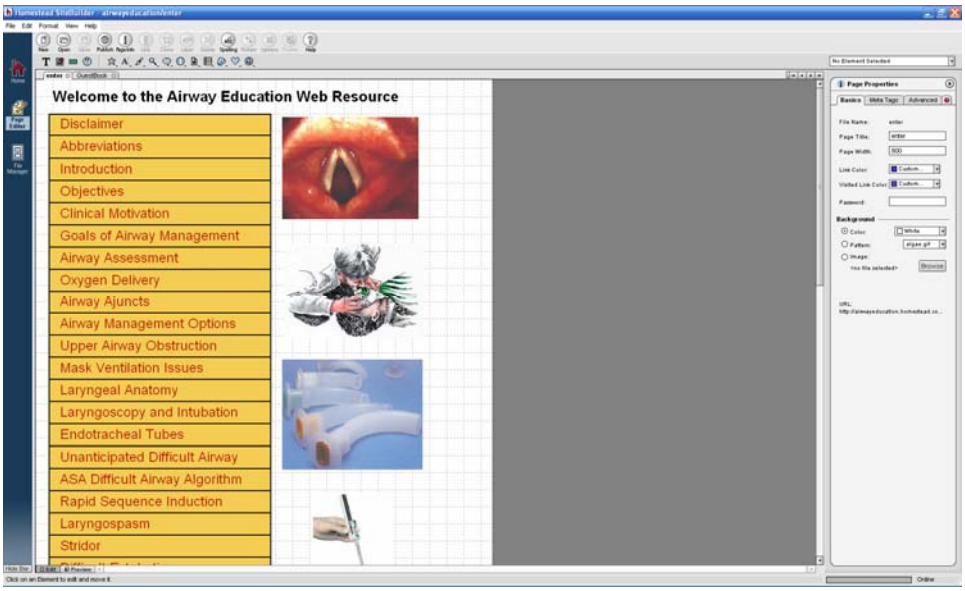

Figure 2. The Homestead editing page for the original version of the Web site developed for this project. The main menu portion of the project is shown here.

Table 1. Design Pitfalls to Avoid in Web Page Design

(Collected from a variety of Web sites, such as http://www.doghause.com/top15.asp)

- Backgrounds should enhance a site, but backgrounds that distract or make the text too hard to read should be avoided.
- Text should be readable. Text that is too small, badly coloured, closely aligned against the left edge of the screen, or text that stretches across the full page can be hard to read.
- Bad use of text formatting distracts readers. Paragraphs that are all bold, all capitals, all italic can be annoying to read. Underlined text that is not a hyperlink only serves to confuse.
- Hyperlinks need to be obvious, but blue link borders around images simply look awful. (But these are nothing compared to the frustration of dead links!).
- Graphics can make or break a site, but avoid large files that take forever to load. Similarly, avoid graphics that do not fit on the screen in 640 x 480 mode.
- Only use table borders if they are actually required.
- Avoid anything that blinks.
- Don't bother with “under construction” signs; if a section is not ready, then there is no point in having a link to it.
- Avoid pointless bits and pieces such as counters, advertising, or pictures of meaningless awards.
- Avoid bad or unclear navigation.

Digital Learning Objects

Digital Learning Objects (DLOs) are an important new concept in educational technology that I was interested in learning more about as part of this project, especially because DLOs are expected to lead to major changes in the manner educational materials are developed and delivered.

For readers new to DLOs, the central idea is that educational resources – especially computer-based educational resources - can now be designed in a modular manner, consisting of one or more reusable DLOs integrated together in some sensible manner. Thus, instead of developing all components of an educational project from scratch, some (or even all) of the DLOs needed for an educational resource may already be constructed and readily available to use with minimal effort. Such an arrangement has the potential to dramatically reduce the effort required to develop new educational resources, as well as produce improvements in quality and availability over a product constructed by conventional means.

Wiley (2000) explains DLOs this way: “This is the fundamental idea behind learning objects: instructional designers can build small (relative to the size of an entire course) instructional components that can be reused a number of times in different learning contexts. Additionally, learning objects are generally understood to be digital entities deliverable over the Internet, meaning that any

number of people can access and use them simultaneously (as opposed to traditional instructional media, such as an overhead or video tape, which can only exist in one place at a time). Moreover, those who incorporate learning objects can collaborate on and benefit immediately from new versions. These are significant differences between learning objects and other instructional media that have existed previously".

The central notions of a DLO are that: (1) the object can be used in a variety of educational modules without special efforts at interfacing and integration, and (2) associated with the object itself is an entry in a database entry describing the object in sufficient detail that learners and educators seeking learning resources can search for available learning objects in the database without actually examining the individual candidate objects themselves. Sometimes DLOs have been compared to Lego bricks, a useful but rather limited analogy.

A practical example may help clarify this idea. Dr Smith wants to develop an on-line module on HIV / AIDS for first year medical students. She anticipates that the module will take about three hours for her students to complete and that it would consist of a series of paragraphs to read, as well as contain graphic images, some animations, some video clips and an interactive section where the students' knowledge is evaluated based on a series of multiple choice questions.

She discusses this project with Dr. Jones, who points out that many of the resources she may need for this project are readily available for free download from the AIDS Digital Education Collective (unfortunately a nonexistent entity), which has a considerable number of images, video clips and other resources pertaining to virus construction and replication, antiviral therapy and many other aspects of HIV / AIDS. Furthermore, the quality of the resources has been reviewed for accuracy and clarity by a panel of experts. And finally, all the resources are available to use without restrictions of any kind, using a “copyleft” arrangement.

To add emphasis to the above, a key notion for DLOs is educational resources can be designed in a modular manner, with one or more reusable DLOs integrated together much like Lego blocks can be assembled together to make a toy, or amino acids can be linked together to make a protein. Furthermore, instead of developing all components of the project from scratch, some (or even all) of the DLOs needed for an educational resource may already be constructed and readily available to use with almost no effort. The hope is that such an arrangement might dramatically reduce the effort to develop quality educational resources, as well as produce improvements in quality and availability over an educational product constructed by conventional means.

But for such dreams to be realized, users of DLOs must share a common set of concepts and terminology; otherwise the likelihood of unnecessary interfacing or

connecting problems arising is great. This requires that we briefly consider some of the concepts and terminology related to DLOs with an emphasis on taxonomy, an issue discussed later.

Figure 3 below illustrates one model of educational resources, where a course consists of a number of lessons, a lesson consists of a number of learning objects, a learning object consists of a number of information objects, and an information object consists of a number of raw content items.

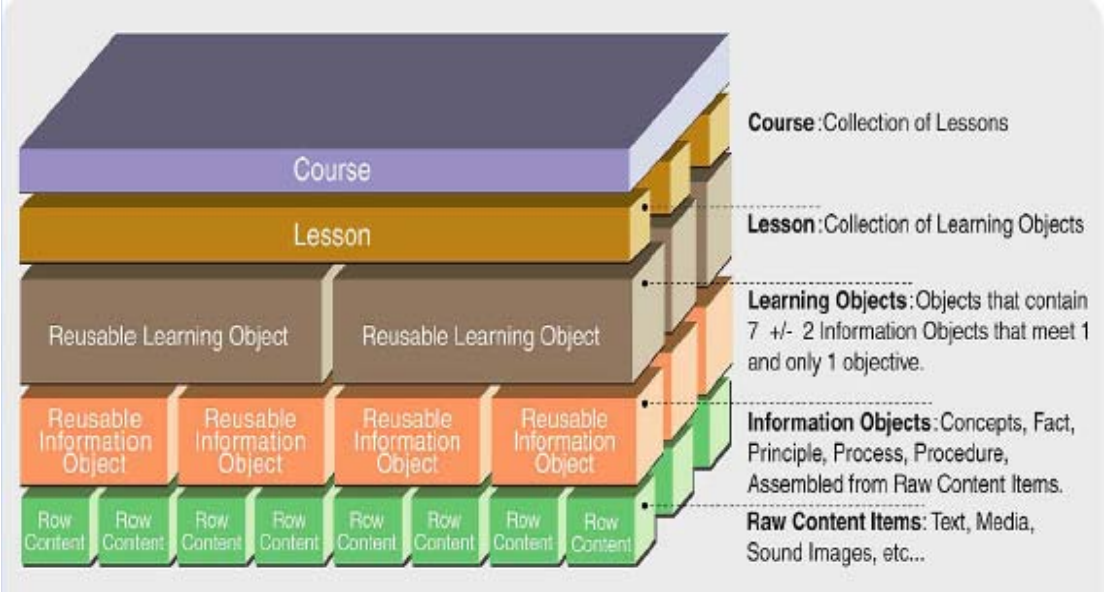

Figure 3. Autodesk Content Model

(http://pnclink.org/annual/annual2002/pdf/0921/11/e211105.pdf)

While this is an interesting model for digital educational resources, it suffers from the fact that the usual learning object definitions used in the educational technology literature permit items at all of these levels to be considered to be learning objects. That is, in most learning object definitions used (see discussion

in Wiley (2000), Chapter 1) items as simple as graphic images or sound clips or as complex as full lessons or courses can all be considered to be learning objects. I have instead proposed the following simpler definition: *A Digital Learning Object (DLO) is any digital entity with associated metadata that may be used for learning, education, and training.* By “metadata” (literally "data about data") I simply mean descriptive information about a digital learning resource, such as learning object type, file size or the title of the resource (see Table 2 and http://ltsc.ieee.org/wg12/ for more information).

One important element of this project was that the use of learning object technology be explored in the context of developing an educational Web site. As emphasized earlier, the central idea of a learning object in this setting is that: (1) the object can be used in a variety of educational modules without special efforts at interfacing and integration, and (2) associated with the object itself is an entry in a database entry describing the object in sufficient detail that learners and educators seeking learning resources can search for available learning objects in the database without actually examining the individual candidate objects themselves. There are a large variety of objects that might be included in such a database. They may be as simple as a drawing or a photograph or as complex as an entire book. They can be video clips, entire movies, single paragraphs, entire manuscripts and anything in between. However, in every case associated with the object has a database entry that characterizes the item (Table 2).

1. **Title**
2. **Language** (*e.g., English, French, Italian etc.)*
3. **Author(s)**
4. **Object Type** *(e.g., graphic image, animation, video clip, pure text file, HTML file, Microsoft Word file, PDF file etc*.)
5. **Bibliographic Citation**
6. **Type of Interactivity** *(**active** (e.g., simulations, exercises, problems), **passive** (e.g., video clips, graphic images, PDF documents), **mixed**.*
7. **Semantic Density** (for an explanation of this interesting concept see http://ltsc.ieee.org/wg12/files/LOM_1484_12_1_v1_Final_Draft.pdf)
8. **Target Audience** *(e.g., elementary school students, high-school students, senior undergraduates, medical students, etc.)*
9. **Intellectual Property Status** *(e.g., copyleft, full copyright kept by author, Creative Commons license, public domain, status unknown).*
10. **Cost** *(whether use of this learning object requires payment)*
11. **Original Publication Date**
12. **Date of Last Revision / Revision Number**
13. **Peer-Reviewed Status** *(e.g., not yet reviewed, internally reviewed, externally reviewed)*
14. **Object size** in bytes
15. **Free Form Comments**

Table 2. Possible Fields in a Digital Learning Object Database

Definitions and Taxonomy

While various taxonomies of learning objects have been proposed (see, for instance, http://www.cjlt.ca/content/vol28.3/c_g.html), in the course of my explorations I came to propose a particular *hierarchical* taxonomy of learning objects which I believe to be particularly helpful at the level of discrete digital objects. This is shown in Table 3 below.

- A **learning object** consists of at least one of the following **types**: (educational) module, section, paragraph, figure, table, response unit or hyperlinked entity.
- A **module** consists of one or more sections.
- A **section** consists of at least one of the following: paragraph, figure, table, response unit or hyperlinked entity.
- A **paragraph** consists of one or more sentences.
- A **figure** consists of a graphical element and an optional text element (figure legend)
- A **table** consists of a grid element and an optional text element (table legend)
- A **response unit** consists of a means to obtain one or more responses from the user, such as answers to multiple choice questions or free text narrative commentary.
- A **hyperlinked entity** is any digital object (animation, applet, audio clip, video clip, PDF file etc.) which is accessed by reference rather than being directly part of a resource.

Table 3. A Hierarchical Taxonomy of Learning Objects Developed as Part of This Project.

Challenges with Learning Objects

It is important to bear in mind that DLOs are relatively new to the educational scene, and many challenges await their widespread application. For instance, one critic of learning objects has made the following critical observations (Nash, 2005):

- It would be almost impossible to overstate the amount of hype that has gone into the subject of learning objects.
- The confusion is interesting because very few people agree on what a learning object is, and even fewer consistently use the same language to describe them.
- When searching for "learning objects," one is likely to encounter a vast array of terms and ways to describe them. Terms include knowledge objects, educational objects, knowledge chunks, digital objects, digital educational computer programs, Flash-exercises - on and on.

Nash also lists problems that occur once one has “untangled the nomenclature problem”:

- **Problem 1**---Not really interchangeable
- **Problem 2**---Can't find them (lack of consistent classification schemes)
- **Problem 3**---Quality is highly variable, despite the attempts of some to institute peer review, or quality criteria.

Content Development

A substantial amount of time was devoted to content development; that is, writing paragraphs and figure legends, finding images suitable to illustrate a teaching point, finding external Web resources to link to etc. To a substantial degree I was able to rely on content developed earlier for various book chapters I had written, but modifications to make the islands of material more self-contained and better illustrated were nevertheless necessary.

A good deal of time was spent searching for images that would best compliment the text in each island of material. This task was greatly simplified by the availability of a number of images search engines (Table 4), which I took advantage of to a substantial degree. It should also be borne in mind that that while these images may be freely downloadable, unless they are in the public domain or have an appropriate Creative Commons license, all images remain the intellectual property of their lawful owners and their use in commercial publications usually requires permission (Farrell, 2006). The legal situation is perhaps less clear when copies of images are used on the Web are used under the claim of “fair use” legal principles or when the images displayed on a Web page are dynamically obtained from a separate site via “hot linking”.

All of the clinical images used in the project were tagged with an image credit line giving the URL where the image was obtained. Unfortunately, in many cases these images have an uncertain ownership heritage, such as images that have

originally been scanned from journals and textbooks and posted without mentioning their origins. However, in the future, the use of images and other materials bearing various forms of Creative Commons license may make the intellectual property aspects of such projects vastly simpler.

Google Image Search	http://images.google.com
AltaVista Image Search	http://www.altavista.com/image
Ithaki	http://www.ithaki.net/images/
Picsearch	http://www.picsearch.com
Ditto	http://www.ditto.com
Yahoo	http://images.search.yahoo.com
Searchmash	http://www.searchmash.com
Fagan Finder	http://www.faganfinder.com/img/
Lycos Image Search	http://multimedia.lycos.com

Table 4. Some Popular Image Search Engines.

Note that some of these are not exclusively image search engines. Ithaki is a "meta" search engine that compiles results from a number of sources.

The Creative Commons project, which maintains an online presence at www.creativecommons.org, “provides free tools that let authors, scientists, artists, and educators easily mark their creative work with the freedoms they want it to carry”. The following information from the Creative Commons Web site explains the concept in brief: “Creative Commons defines the spectrum of possibilities between full copyright — all rights reserved — and the public domain — no rights reserved. Our licenses help you keep your copyright while inviting certain uses of your work — a "some rights reserved" copyright.”

Figure 4. The Creative Commons Web site (www.creativecommons.org)

Web Page Development – Practice

In an earlier section I discussed some of the theoretical issues concerned with Web site development. I would now like to comment on some of the practical issues with Web site development encountered in the project.

My original plan is to develop a series of learning objects and then use them to construct a number of “islands” of information in Web page format. This initiative thus began by using Microsoft Word to produce a series of text-only stand-alone documents that would form learning objects on their own. When complete, these Microsoft Word files were then made into pure ASCII text files to form a similar series of stand-alone learning objects in pure text format.

Once the text material was completed, attention was directed a establishing a series of graphic images that could both stand on their own or be incorporated into a composite learning object in conjunction with one of the text-only learning objects described above. In either case, associated with each graphic image would ordinally be a both a figure legend to help explain the meaning of the image as well as an “image credit” explaining where the image came from.

A third type of learning object entity, hypertext links to external materials, was also collected with a view to incorporating them into the various Web pages. This external material consisted mostly of scientific review articles in PDF format as well as some educational videos.

With this material at hand, construction of the various Web pages comprising the site began (e.g., Figures 5 to 7). Although Homestead offers a number of template pages that can be used to produce a consistent “look and feel” across a site, I found none that appealed to my conservative and minimalist tastes, and I eventually decided to start each Web page “from scratch”, relying on a simple brownish yellow background (color #F4CE53) for each pages backdrop. To this background I added text material from one of the pure text learning objects developed earlier, as well as zero or more graphic images with their associated figure legends.

Following the importation of these learning objects, in order to produce an aesthetically pleasing result it was necessary to format each Web page using Homestead’s various controls. Not infrequently, this was followed by an inevitable compulsion to reedit the text component, now making it slightly different from the original learning object from which the text was based. This, of course, resulted in a lack of direct correspondence between the Web page and the learning objects upon which it was originally based, with the result that all of the learning objects had to then be reconstructed to reflect the further editing that all writers are by nature drawn to.

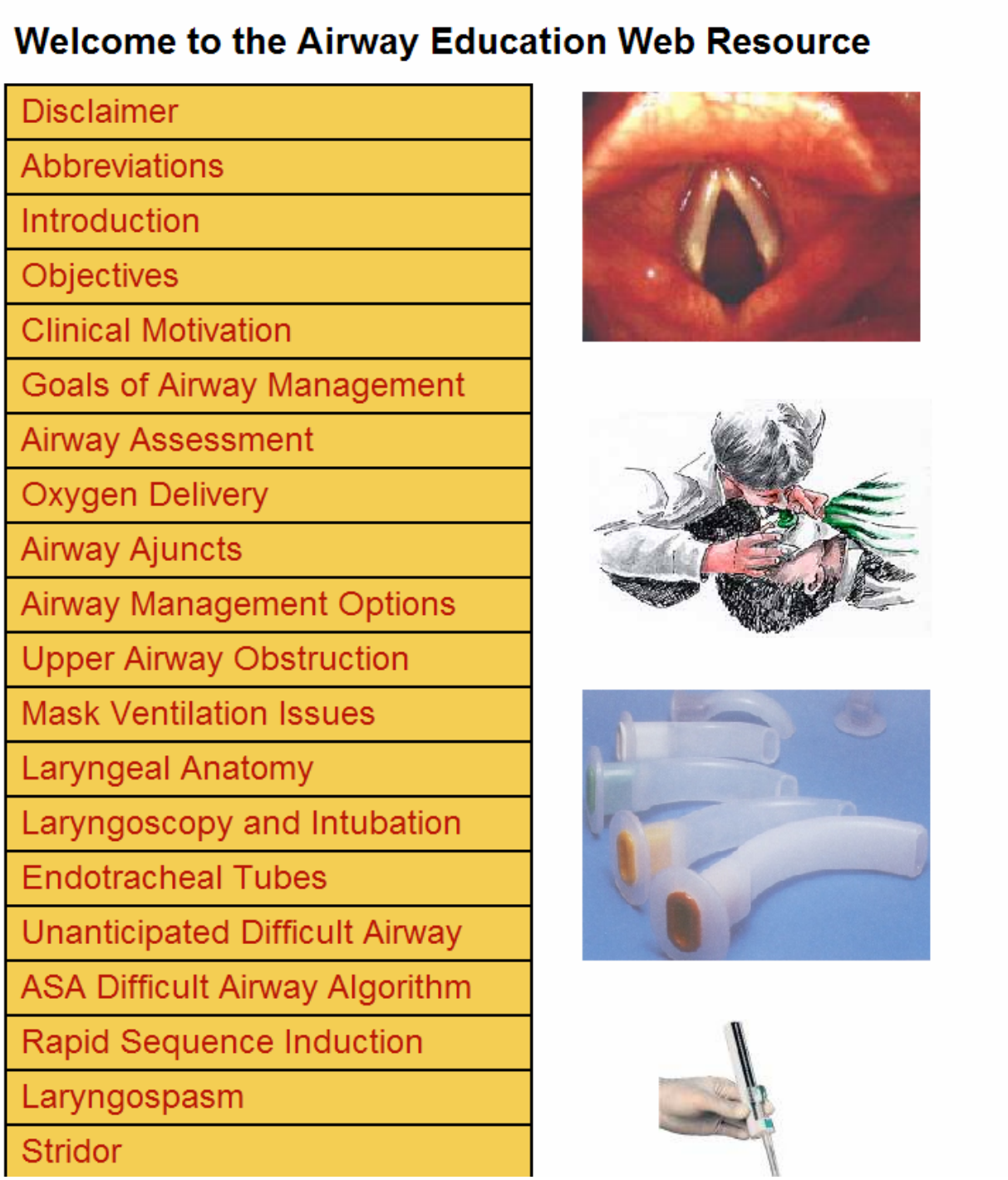

Figure 5. Partial screen capture of the main menu for the original project Web site.

Figure 6. Screen capture of one of the islands of information from the project Web site.

Clinical Case 5

Parturient with Tracheal Stenosis

A 31 year old woman at 37 weeks gestation was referred for tracheal dilatation because of dyspnea and biphasic stridor at rest. Bronchoscopy "revealed severe subglottic stenosis with a 3-mm tracheal lumen." As the added work of breathing presented by the stenosis was not compatible with the ventilatory requirements for labor, it was decided to carry out a balloon dilatation of the trachea. This was done under local anesthesia as follows: "A flexible fiberoptic bronchoscope was passed through the larynx so that a clear view of the proximal end of the stenosis was seen. The stenosis originated 2 cm from the glottis, was 3-4 mm in diameter, and appeared web-like... A balloon-tipped catheter was advanced via the trachea within the stenosis. At this time, the patient was asked to hold her breath and the balloon was inflated to 60 PSI for 20 seconds to dilate the stenotic area. After a brief respite for the patient, the procedure was repeated." At immediate followup bronchoscopy the web-like stenosis had been cleared, while the patient had immediate subjective improvement. Mother and baby did fine thereafter.

Discussion

Other options exist in managing tracheal stenosis, including laser surgery to excise stenotic tissue, tracheal resection surgery or tracheal stenting. The method of balloon dilatation can be done under local anesthesia and is relatively less invasive, likely advantages in a pregnant patient.

Reference

Salama DJ and Body SL. Management of a term parturient with tracheal stenosis. British Journal of Anaesthesia 1994; 72:354-357.

Figure 7. Screen capture of one of the didactic cases from the project Web site.

At one point I thought that might be a good idea to “polish” the source code produced by the Homestead software system with a view to improving upon it. This turned out to be a bad idea. It turns out that the source code produced by Homestead is not optimized to allow human optimization, as the sample code shown on the next page (the source code for Case 1) illustrates. Furthermore, if the Homestead system is used a further time to make further changes to the Web page in question, any hand editing will be lost anyway. As a result, my attempts to “hand polish” the source code ended up being rather short-lived.

Another issue with Homestead that presented some difficulty for me was in attempting to produce a version of the project to run on a CD-ROM or USB flash drive. Thus far, attempts to use the **File – Save As** command in Internet Explorer to save the Web site onto a local drive have resulted in fatal errors. However, there a number of “work arounds” may still be available, such as downloading the materials using Firefox or another web browser, or using a utility such as **WebWhacker** (http://www.bluesquirrel.com/products/webwhacker/), **WebReaper** (http://www.webreaper.net) or similar utility.

Clinical Case 1

A Newspaper Clipping Tells it All

A newspaper clipping tells the tragic story (Montreal Gazette Feb. 1994): "The death of a woman during childbirth at LaSalle General Hospital could have been avoided if doctors had checked her respiratory tract before anesthetizing her for a caesarean birth, a coroner says." According to the coroner "the woman died of asphyxiation and heart failure during surgery because doctor hadn't checked to see whether she would be able to breathe while unconscious". According to the newspaper account, the patient had a rare condition where the back of her tongue covered "nearly all her throat" and noted that the patient "was unable to breathe through the face mask" applied to her face. After the doctors "tried several times to give her oxygen through tubes" (but failed because they were all too large), a surgical airway was attempted, but cardiac arrest occurred before the airway could be secured, and the patient died.

Discussion

Hypertrophy of the lingual tonsils is an unusual condition that may cause complications such as airway obstruction, abscess, sleep apnea, and recurrent epiglottitis. While some lesions are visible at the bedside (e.g. while checking the Mallampati classification of the patient's oropharynx), many others may not be visible at all without special tools generally used only by ENT specialists. In this respect, the coroner may have been unfair in his judgment. A similar tragedy involving a 24-year-old woman whose markedly hypertrophied lingual tonsils prevented intubation after anesthetic relaxation during preparation for appendectomy has been reported by Cohle et al (1993). The huge hypertropic tonsils totally obstructed the glottic aperture after induction, resulting in a "can't intubate/can't ventilate situation". A recent review of the literature has been published by Ovassapian et al. (2002).

References

Cohle SD, Jones DH, Puri S. Lingual tonsillar hypertrophy causing failed intubation and cerebral anoxia. Am J Forensic Med Pathol 1993 14:158-61

Ovassapian A, Glassenberg R, Randel GI, Klock A, Mesnick PS, Klafta JM. The unexpected difficult airway and lingual tonsil hyperplasia: a case series and a review of the literature. Anesthesiology. 2002;97:124-32.

Figure 8: The Web page for Clinical Case 1. Compare this with the source code for this page, shown in the next figure.

Figure 9: The source code corresponding to the Web page for Clinical Case 1.

```
<!DOCTYPE HTML PUBLIC "-//W3C//DTD HTML 4.01 Transitional//EN">
<html>
	<head>
		<!-- <hs:metatags> -->
		<meta http-equiv="Content-Type" content="text/html; charset=ISO-8859-1">
		<meta name="generator" content="Homestead SiteBuilder">
		<!-- </hs:metatags> -->

		<!-- <hs:title> -->
		<title>Case1</title>
		<!-- </hs:title> -->
		<script type="text/javascript">
			<!--
function reDo() {
	top.location.reload();
}
if (navigator.appName == 'Netscape' && parseInt(navigator.appVersion) <
5) {
	top.onresize = reDo;
}
dom=document.getElementById
			//-->
		</script>
		<link type="text/css" href="http://www.homestead.com/~media/elements/Text/font_styles_ns4.css" rel="stylesheet">
		<style type="text/css">
			@import url(http://www.homestead.com/~media/elements/Text/font_styles.css);
		</style>

	</head>
	<body onunload="" onload="" id="element1" link="#3333CC" bgcolor="#FFFFFF" scroll="auto" vlink="#6633CC">
		<noscript>
			<img alt="" src="http://www.homestead.com/~media/elements/shared/javascript_disabled.gif" height="40" border="0"
width="373">
		</noscript>
		<!-- <hs:element2> -->
		<div style="position: absolute; top: 32px; left: 30px; width: 589px; height: 609px; z-index: 0;" id="element2"><div style="height:
609px; padding: 15; border-width: 0; border-color: #000000; border-style: solid; background-color: #F4CE53;"><div><font face="Helvetica, Arial, sans-serif"
class="size10 Helvetica10" color="#000000"><b>Clinical Case 1</b><br></font></div><div><font face="Helvetica, Arial, sans-serif" class="size10
Helvetica10" color="#000000"><br></font></div><div><font face="Helvetica, Arial, sans-serif" class="size12 Helvetica12" color="#000000"><b>A Newspaper
Clipping Tells it All   </b><br></font></div><div><font face="Helvetica, Arial, sans-serif" class="size10 Helvetica10"
color="#000000"><br></font></div><div><font face="Helvetica, Arial, sans-serif" class="size10 Helvetica10" color="#000000">A newspaper clipping tells the
tragic story (Montreal Gazette Feb. 1994): &#8220;The death of a woman during childbirth at LaSalle General Hospital could have been avoided if doctors
had checked her respiratory tract before anesthetizing her for a caesarean birth, a coroner says.&#8221; According to the coroner &#8220;the woman died of
asphyxiation and heart failure during surgery because doctor hadn&#8217;t checked to see whether she would be able to breathe while
unconscious&#8221;. According to the newspaper account, the patient had a rare condition where the back of her tongue covered &#8220;nearly all her
throat&#8221; and noted that the patient &#8220;was unable to breathe through the face mask&#8221; applied to her face. After the doctors &#8220;tried
several times to give her oxygen through tubes&#8221; (but failed because they were all too large), a surgical airway was attempted, but cardiac arrest
occurred before the airway could be secured, and the patient died. <br></font></div><div><font face="Helvetica, Arial, sans-serif" class="size10 Helvetica10"
color="#000000"><br></font></div><div><font face="Helvetica, Arial, sans-serif" class="size10 Helvetica10" color="#000000"><b>Discussion 
</b><br></font></div><div><font face="Helvetica, Arial, sans-serif" class="size10 Helvetica10" color="#000000"><br></font></div><div><font
face="Helvetica, Arial, sans-serif" class="size10 Helvetica10" color="#000000">Hypertrophy of the lingual tonsils is an unusual condition that may cause
complications such as airway obstruction, abscess, sleep apnea, and recurrent epiglottitis. While some lesions are visible at the bedside (e.g. while checking
the Mallampati classification of the patient&#8217;s oropharynx), many others may not be visible at all without special tools generally used only by ENT
specialists. In this respect, the coroner may have been unfair in his judgment. A similar tragedy involving a 24-year-old woman whose markedly
hypertrophied lingual tonsils prevented intubation after anesthetic relaxation during preparation for appendectomy has been reported by Cohle et al (1993).
The huge hypertropic tonsils totally obstructed the glottic aperture after induction, resulting in a &#8220;can&#8217;t intubate/can&#8217;t ventilate
situation&#8221;.  A recent review of the literature has been published by Ovassapian et al. (2002).<br></font></div><div><font face="Helvetica, Arial,
sans-serif" class="size10 Helvetica10" color="#000000"><br></font></div><div><font face="Helvetica, Arial, sans-serif" class="size10 Helvetica10"
color="#000000"><b>References</b></font><font face="Helvetica, Arial, sans-serif" class="size10 Helvetica10" color="#000000"> 
<br></font></div><div><font face="Helvetica, Arial, sans-serif" class="size10 Helvetica10" color="#000000"><br></font></div><div><font face="Helvetica,
Arial, sans-serif" class="size10 Helvetica10" color="#000000">Cohle SD, Jones DH, Puri S. Lingual tonsillar hypertrophy causing failed intubation and
cerebral anoxia. Am J Forensic Med Pathol 1993 14:158-61<br></font></div><div><font face="Helvetica, Arial, sans-serif" class="size10 Helvetica10"
color="#000000"><br></font></div><div><font face="Helvetica, Arial, sans-serif" class="size10 Helvetica10" color="#000000">Ovassapian A, Glassenberg
R, Randel GI, Klock A, Mesnick PS, Klafta JM.   The unexpected difficult airway and lingual tonsil hyperplasia: a case series and a review of the
literature. Anesthesiology. 2002;97:124-32.<br></font></div></div></div>
		<!-- </hs:element2> -->
		<!-- <hs:realtracker> -->
		<script type="text/javascript">
			<!--
var id='';var res='';var partnerid=90006;
var user='1750604906';
var pp='Case1';
function f(s){f2(s)};
function f2(s){document.write('<img alt="" src="'+s+'" height="1" width="1" border="0"/>')};
			//-->
		</script>
		<script
src="/~site/Scripts_ExternalRedirect/ExternalRedirect.dll?CMD=CMDGetJavaScript&amp;H_SITEID=RTK1&amp;H_AltURL=%2F%7Esite%2Frealtracker%2
Frt_s90022.js&amp;HSGOTOURL=http%3A%2F%2Flayout1.realtracker.com%2Fincludes%2Frt_s90022a.js" type="text/javascript">
		</script>
		<script type="text/javascript">
			<!--

	f('/~site/Scripts_ExternalRedirect/ExternalRedirect.dll?CMD=CMDGotoURL&H_SITEID=RTK1&H_AltURL=%2f%7esite%2ftp.gif&H_HSGOTOU
RL=http%3a%2f%2fweb4.realtracker.com%2fnetpoll%2fimulti.asp&user='+escape(user)+'&pn='+escape(partnerid)+'&pp='+escape(pp)+'&js=1&to=-
360&userurl='+escape(location.href)+res);
			//-->
		</script>
		<noscript>
			<img alt=""
src="/~site/Scripts_ExternalRedirect/ExternalRedirect.dll?CMD=CMDGetGif&amp;H_SITEID=RTK2&amp;H_AltURL=%2F%7Esite%2Ftp.gif&amp;H_HSGO
TOURL=http%3A%2F%2Fweb4.realtracker.com%2Fnetpoll%2Fimulti.asp%3Fuser%3D1750604906%26pn%3D90006%26pp%3DCase1%26js%3D0%26b%
3D0%26to%3D-360" height="1" border="0" width="1">
		</noscript>
		<!-- </hs:realtracker> -->
	</body>
</html>
```

Revisions

Upon completion of the initial draft of the Web site, an e-mail invitation was sent out to members of the Society for Airway Management asking for comments and suggestions for improvement. Most comments received focused on issues of content (especially typographical errors) rather than issues of organization.

In addition, a thorough review by Dr. Terry Anderson led to a number of additional suggestions for improvement. These particular improvements included a new two-level menu structure (see Figure 10), a new URL (http://airwayeducation.net), links to further reading materials and comments about the authors credentials and the intended audience for the Web site.

To address the issue of author credentials, I added a section entitled “Author Credentials”. In addition, as noted above, I employed a technique known as “domain forwarding” to allow users to utilize the somewhat more “credible” URL of http://airwayeducation.net in order to access the Web site. The new URL for the site is thus now http://airwayeducation.net, although it may still be accessed by the old URL http://airwayeducation.homestead.com.

The new links to further reading materials were predominantly links to the open access medical literature, so they could be accessed without requiring a subscription or a university library membership. In addition, in the introduction I

provided the names of some standard textbooks of airway management that readers may consult for further details.

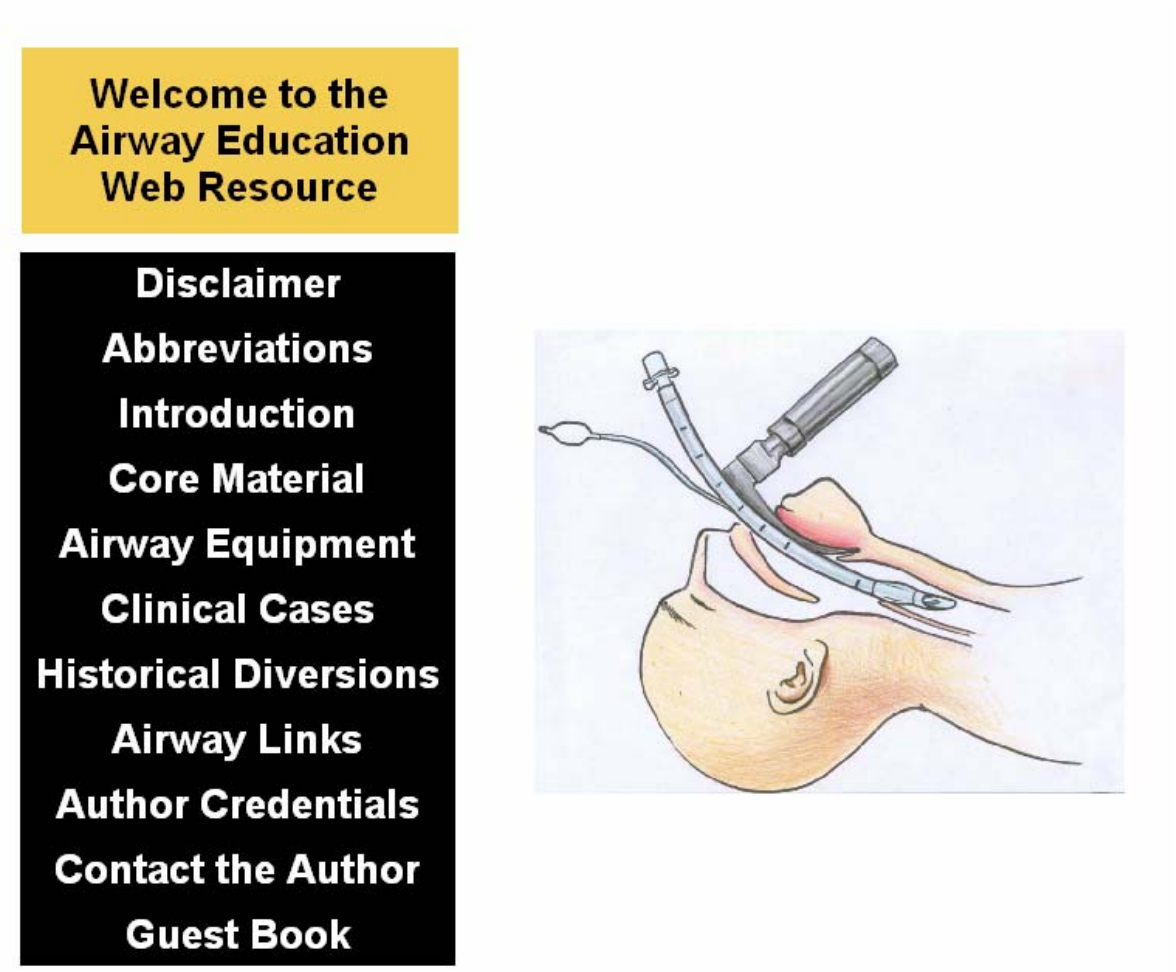

Figure 10. Screen capture of the main menu for the revised project Web site. Each menu item leads to a secondary menu.

What I Would do Differently Next Time

If I had to do things again, next time around I would start by taking a more focused approach to the project. In retrospect, considerable time was spent evaluating a number of Web page production packages that might have been better spent focusing on content development and evaluation. Although I learned a lot by comparing packages such as Microsoft FrontPage and Abobe Dreamweaver, these efforts ended up being somewhat peripheral to the goals of the project, and in retrospect I would have been better off deciding to use Homestead directly rather than conducting informal comparison studies. This conclusion not withstanding, the time spent evaluating the various Web page authoring packages was hardly time wasted, as I learned a lot that was helpful for other projects.

I also learned that while learning about learning objects is interesting, they are not yet so ubiquitously available that I could find an appropriate collection to serve in my Web site project. In the end, I had to make up my own learning objects and then incorporate them into the Web site, followed by reconstructing the learning objects as a result of ongoing editing of the Web site. This suggests that if one wants to link a Web site to learning objects, it might be more sensible to construct any learning objects from the polished Web site rather than the other way around. Next time around I would construct the Web site first, and extract the learning objects secondarily.

Ideas for Future Work

Like all academic undertakings, time and resource restrictions limit what can reasonably be achieved in any course project. It is thus interesting to consider what might be done to extend this project further. My first recommendation in this respect would be to subject the project to a peer-review process, as discussed next.

The initial version of the site would involve an internal review process by one or more clinicians with an interest in clinical airway management (e.g., members of our department with an interest in clinical airway management). Following the revisions based on their comments, I would then have the site reviewed by the Health on the Net Initiative (www.hon.ch, Table 5) with the eventual goal of certification by this agency. In addition, I would later invite members of the Society for Airway Management (www.samhq.com) (the ultimate subject matter experts) to review the site and provide further feedback either in narrative form (a choice that most individuals will likely prefer) or through a structured questionnaire ("rubric"). Another issue is whether another review process focusing on Instructional Design issues would be necessary, for instance as might be executed according to guidelines published by Gibbs et al (2001).

Another idea for future work is to submit the project for possible registration with Project Merlot, located at http://merlot.org, which seeks to provide high-quality

peer-reviewed teaching materials in a number of disciplines of higher education. Note that although Project Merlot accepts medical education materials, this is not its primary focus.

Here is a description of Project Merlot taken from the Web site:

> MERLOT conducts structured peer review of online teaching-learning materials. The primary purpose of the reviews is to allow faculty from any institution of higher education to decide if the online teaching-learning materials they are examining will work in their courses. The emphasis on the user's perspective is the reason why the peer reviews are performed by peer users of instructional technology, and not necessarily peer authors of instructional technology. The MERLOT peer review process for evaluating teaching-learning materials follows the model of peer review of scholarship. Each review is conducted by at least two higher education faculty members who, from their individual reviews, compose a "composite review" that is posed to the MERLOT website. Currently peer review is being conducted in twelve discipline-based communities.

1 - Authority
Any medical or health advice provided and hosted on this site will only be given by medically trained and qualified professionals unless a clear statement is made that a piece of advice offered is from a non-medically qualified individual or organisation.

2 - Complementarity
The information provided on this site is designed to support, not replace, the relationship that exists between a patient/site visitor and his/her existing physician.

3 - Confidentiality
Confidentiality of data relating to individual patients and visitors to a medical/health Web site, including their identity, is respected by this Web site. The Web site owners undertake to honour or exceed the legal requirements of medical/health information privacy that apply in the country and state where the Web site and mirror sites are located.

4 - Attribution
Where appropriate, information contained on this site will be supported by clear references to source data and, where possible, have specific HTML links to that data. The date when a clinical page was last modified will be clearly displayed (e.g. at the bottom of the page).

5 - Justifiability
Any claims relating to the benefits/performance of a specific treatment, commercial product or service will be supported by appropriate, balanced evidence in the manner outlined above in Principle 4.

6 - Transparency of authorship
The designers of this Web site will seek to provide information in the clearest possible manner and provide contact addresses for visitors that seek further information or support. The Webmaster will display his/her E-mail address clearly throughout the Web site.

7 - Transparency of sponsorship
Support for this Web site will be clearly identified, including the identities of commercial and non-commercial organizations that have contributed funding, services or material for the site.

8 - Honesty in advertising & editorial policy
If advertising is a source of funding it will be clearly stated. A brief description of the advertising policy adopted by the Web site owners will be displayed on the site. Advertising and other promotional material will be presented to viewers in a manner and context that facilitates differentiation between it and the original material created by the institution operating the site.

Table 5. Synopsis of the Health on the Net Code of Conduct

(taken from http://www.hon.ch/HONcode/Conduct.html).

In the particular case of medical education, MedEdPORTAL is a Web-based resource from the Association of American Medical Colleges (AAMC) with an online presence at http://www.aamc.org/meded/mededportal/. MedEdPORTAL offers a variety of materials that have undergone a peer-review process. According to the Web site MedEdPORTAL “is a Web-based tool that promotes collaboration across disciplines and institutions by facilitating the exchange of peer-reviewed educational materials, knowledge, and solutions” and serves “as a central repository of high quality educational materials such as PowerPoint presentations, assessment materials, virtual patient cases, and faculty development materials”. Any medical educator may submit materials for possible publication on MedEdPORTAL. The material is then screened by an AAMC staff to ensure that it meets the minimal requirements for inclusion and does not violate patient privacy. Suitable material is then assigned to three reviewers, at least one who will have expertise in the content area, and at least one who will have expertise in the educational format of the material. Finally, MedEdPORTAL uses the well-known Creative Commons copyright system to provide a copyright usage license with their work (see http://creativecommons.org for details).

Another idea for future work is to introduce interactivity to the Web site. Web-based interactivity can be implemented in various ways. For instance, a section of a Web page may ask the student a question, and offer four possible answers the student may click on. Depending on the student’s response, the Web page can provide a different commentary. Other forms of Web-based interactivity may

involve the use of discussion forums or online surveys and polls. Providing e-mail addresses (and "mailto" links) for authors or instructors can also help make material more interactive, as was actually done for this project. Advanced interactivity may also be achieved using JavaScript, a popular and relatively easy to learn programming language for Web pages.

With respect to JavaScript, as part of this project I spent a considerable bit of time testing out a number of JavaScript programs to learn about its potential for adding interactivity to this project. It should be noted that JavaScript is not part of HTML, but is used in an HTML program. As an example, the following JavaScript statement will write a message on the Web page using a blue font:

```
document.write("<FONT COLOR='BLUE'>This Is Blue Text</FONT>")
```

while this statement will cause a pop-up alert box to be displayed:

```
alert("<FONT COLOR='BLUE'>This Is Blue Text</FONT>")
```

However, in the end, I came to the conclusion that my time would be best spent focusing on developing quality content, and plans for adding interactivity based on JavaScript were put aside for the moment.

References

Wiley D. (2000).The Instructional Use of Learning Objects. http://www.reusability.org/read/ Accessed July 7, 2007.

Nash S. (2005). Learning Objects and Their Difficulties. http://elearnqueen.blogspot.com/2005/03/learning-objects-and-their.html Accessed April 7, 2007.

Farrell A. (2006). Getting the picture: medical images on the Web. Med Ref Serv Q. 25:47-54.

Flanders V, Willis M. (1998). Web Pages That Suck: Learn Good Design by Looking at Bad Design. Sybex

Gibbs, W., Graves, P. R., & Bernas, R. S. (2001). Evaluation guidelines for multimedia courseware. Journal of Research on Technology in Education, 34(1), 2-17.