Using the Web to Support a Traditional Lecture-Based Course

Abstract

The use of the Internet to support traditional lecture-based courses taught in post-secondary institutions has become quite common but many, if not most such web sites lack organization and serve as little more than "a place to put handouts". This paper discusses some requirements for a supportive web site and what can be learned from some of the extensive research now being done in the field of distance education. An outline of the content useful in a web site designed in a supportive role is also included.

Introduction

Most courses taught in Computer Science still use the traditional lecture plus lab format, usually with one or more required texts as reference. While many instructors now also use the web to augment this, many if not most use it simply as a convenient place to put materials they would normally hand out on paper in class. Some keep all their lecture notes and slides on their laptops or on the web and then display them during class as the basis for their lectures. Students do find it useful to have access to lecture notes and many appreciate being able to print out lecture notes before a class so they can follow along during lectures. Since access to computers and skill in their use is fundamental to any Computer Science curriculum it would seem a natural step to use the Internet as an integral part of an undergraduate course. Virtually all computer science students have access to the Internet, either from campus or from their homes. But instead of just being used as a source for handouts the Internet can and perhaps should be used as an integral part of any computer science course.

The use of the Internet for the delivery of distance education has enjoyed a tremendous surge in popularity in the last few years. Considerable effort has been put into studying the design and effectiveness of such courses [WILK97]. Much can be learned from an examination of the distance education courses but it must be remembered that there are a number of vital differences.

What can be Learned from Distance Education

Distance Education courses are designed to deliver an entire course including on-line testing, chat rooms for student-teacher interaction and various other substitutes for face to face interaction. Many of the courses in existence have changed very little from the correspondence courses from which they grew while others have developed into highly interactive and adaptive learning environments. These are courses designed to be delivered to learners that may be geographically far removed from the source. Delivering course materials is only one of the features required in distance education. These courses must designed with the knowledge that learners may not have access to highly adaptable face to face discussions. Distance education courses must be sensitive to issues of differing learning styles [CORD91] that in a traditional lecture based course can be dealt with in person as they come up. These courses must also provide a way to evaluate learners that may never be seen in person. They must provide security for students and test materials, validation of the learners' identity as well as providing a way for learners to access additional help in answering questions and overcoming problems. Ross [ROSS98] has developed a check list for the evaluation of web based courses which serves as a useful guide for evaluating the effectiveness of distance education courses. This check list can also serve as a starting point for the design and evaluation of a web site whose role is to support a traditional lecture. However many of the most difficult issues related to courses delivered entirely on the web such as those listed do not play a significant role when considering the design of a web site to support a traditional lecture based course. In the latter, the role of the Internet is strictly to support and augment the efforts of the instructor and not to provide a surrogate.

Advantages of Maintaining a Course Web Site

Maintaining a web site to support a traditional lecture based course has many advantages. While the initial overhead can be considerable when first creating a course web site, once it is in place maintaining it requires no more effort (and often less) than is normally required at the start of a new semester. The benefits to the students are many and if properly maintained, such a site can result in a substantial savings of both time and effort to the instructor. A course web site provides an easily accessible central source for notes, assignments, general course information and supplementary materials that will no longer need to be copied and handed out by the instructor. The inevitable extra copies of everything that are left over and discarded or recycled at the end of the term will no longer exist. Students will have time independent access to course material that does not require the presence of the instructor or departmental support staff. It can also provide a source for time-critical information such as changes in due-dates, adjustments to assignment specifications, as well as answers to questions asked in the last class. Lost notes or assignment specifications are no longer an inconvenience as students can access additional copies as required.

Requirements

To be useful the content of the web site must be tied to the lectures which must remain the primary focus of the course. The layout of the site can contribute to or detract from its utility, depending on whether the students can find what they need easily. Consistency is key and each page should have a similar "look and feel", with navigational information in the same relative locations on each page and with similar kinds of links for similar kinds of pages. Assignment specifications for example should follow a similar outline (preamble, problem specification, minimal requirements, testing, marking guidelines, additional information) and each should contain similar links (lab notes, sample solutions, related problems, etc.). A reasonable load-time is not as critical in a site designed to support a course as for one designed for distance education. Learners in distance education courses generally have no choice but to access the required material by connecting to the Internet over a phone line. The students in our courses often access the course web site while on campus and networks available to these students are often equipped with high-speed connections. Faster load times afford greater flexibility with regards to images, animations and other features. It also makes on-line interactive tutorials or demonstrations feasible that might be too slow to be utilized if students are forced to accept slow baud rates. Any required information (assignments etc.) must keep the available facilities in mind – Eg. if students do not have access to other than line printers notes must be printable as text without loss of critical information.

Maintenance

Instructors who are already familiar with HTML may simply create and maintain their web sites using HTML directly. For those who are not there are many commercial packages available that allow someone to create and maintain sizeable web sites with no knowledge of HTML whatsoever. These packages often have many features that allow the user to maintain the integrity of the site with ease. They will keep track of internal links, allow the user to update a remote web site easily, add links and insert images with just a few mouse clicks. Many will recognize files and images that have been modified elsewhere and offer to update links that have become stale.

General Design Criteria

A web site intended as support for a lecture based course can serve many purposes. It can be used to post notes, assignments, and administrative information. It can also be used to house on-line tutorials, off-site links, animations [BECK00a], and perhaps even serve as a "gateway" to the web site that goes with the required textbook (many of the latest books have them now). The goals of a web site intended to take on a supporting role should be kept in mind during the design. It is not meant to *replace* the instructor, just to give students access to the usual information (notes, assignments) along with supplementary material. If done well it will provide much of the background and supplementary material necessary and free the instructor to concentrate on the highlights and most difficult issues during lectures. There are some general criteria that can serve as a starting point (or evaluation check list) when designing a supportive site.

Consistent Layout

A consistent layout is instrumental to ensuring that students can orient themselves quickly and find the information they need with minimal input from the instructor. If each page has the same general format such as the same background and a similar placement of navigational portions of the page (like buttons), then students do not need to spend time finding their way around the site and instructors don't need to spend valuable lecture time giving directions.

Maintainable

A web site to support a traditional lecture based course can only be useful and effective if it is current and that means it must be maintained. This need not require a large time commitment if a few guidelines are followed. Time sensitive material such as dates and items that are likely to change from semester to semester such as text references, etc. should be kept on as few pages as possible. This minimizes the "start-up" effort required to get the site ready for the beginning of a new semester. For the same reasons off site links should also be located as centrally as possible and must be checked regularly. Broken and forbidden links are very frustrating.

Searchable

Once properly set up, web sites to augment lecture based courses can easily grow to include hundreds of pages, images and even more innovative interactive resources. Finding the notes that relate to a specific topic may become a time consuming activity. If it is awkward for students to find the information they need, most will simply wait until class time and ask the instructor. Including a search utility on your site will help students find some answers themselves and may cut down dramatically on the need to devote class time to this.

Site Map

All web sites consisting of more than a few pages should provide some sort of site map. Once the site has grown large enough keeping all pages accessible from one index page becomes unmanageable. Such an approach would be comparable to producing a textbook with no chapters or sections. A moderately sized site should be organized hierarchically to minimize the number of pages that must be visited to get to one's target page. The site map should be accessible from all pages, preferably as a part of each page in the site. If this is not possible, then the site map should never be more than one mouse-click away. The site map must also be simple and intuitive. Avoid the temptation to create the entire "table of contents" as part of the map.

Interlinked Pages

Buttons to move to the previous or next page chronologically already exist in the browser and don't need to be repeated on the page. Instead navigational buttons attached to the page should be linked topically, such as having a button on an assignment page that refers the user to the related lab or tutorial notes.

"What's New" Notes

These notes can form a vital function as a central location for information relating to topic or due date changes. Students can be told to refer to these on a regular basis to get information on anything that has changed recently on the site such as new notes that have been added or corrections that have been made as well as general course related information. If attention is paid to keep this part of the site current at all times, students will learn to rely on this information. It is a convenient way to disseminate information to all students quickly and even those who miss a class can be assumed to have access. To retain its functionality out of date information must be moved elsewhere or removed entirely on a regular basis. This need not take more than a few minutes once each week. The simplest approach is to list additions latest first and then remove than all at the end of the semester.

FAQ by Topic

Most instructors have experienced having to answer the same question numerous times and sometimes it seems that we begin each lecture with the same set of announcements or answer the same question for days on end. Those who make themselves available by email often find themselves typing the same responses to a dozen or more individuals – especially when a difficult concept is first introduced or as the due date for an assignment approaches. An "FAQ" page can save a great deal of time by again providing a central location, accessible by all students any time of day or night for these kinds of queries. As with the "News" page, this must be known to be current or students will not make use of it. This kind of page is also likely to grow quickly – especially on a site that is developed and maintained over several repetitions of a course. To keep the information contained within accessible, it must be subdivided by category, perhaps one section for each topic and separate sections for questions related to assignments and tests.

Content

For obvious reasons the actual content of a web site intended to support a traditional course will vary greatly depending on the nature of the course (programming, theoretical, hardware, etc.) as well as the individual preferences and talents of the instructor maintaining it. There are however a number of common elements that can be included in all.

Outline

Almost all college or university courses provide some sort of general outline that includes information on the general expectations and policies or what students will be required to do in order to pass the course. This can also include a breakdown for how marks are earned in the course as well as general marking guidelines like letter grade equivalents if applicable. This page serves as a general overview of the course, work that must be completed by students and can be the place where deadlines are listed. If relatively short information about exams can go here too. Sample exams or listings of which topics students are responsible for on tests should be elsewhere but can be connected to this page by links.

Syllabus/Schedule

This section should include a detailed syllabus as well as a week by week listing of topics to be covered. Most sites that include this information also note that this page may be updated from time to time and caution students to check back regularly. Some courses such as those that cover core curriculum topics may not change dramatically from semester to semester and the weekly topic listing can be reasonably detailed. Others, particularly more senior courses may change dramatically from one semester to the next. In these courses it is possible to provide a complete listing of all topics that have ever been covered and then use the week by week listing to specify which topics are relevant to the current semester. An introductory programming course that is part of the core curriculum at the University of Calgary [BECK00b] uses the former approach and all topics listed in the syllabus can be found by major heading in the week by week listing. A third year course at the same institution draws from a much larger set of topics each semester than can be covered in the time given. In that case, all topics are listed in the syllabus but only those relevant to the current semester are listed in the week by week table. [BECK00c]. This was originally done to cut down on the amount of maintenance required but has had the unexpected advantage of allowing students access to other pertinent topics. On occasion it has resulted in student requests to cover a topic not originally scheduled. If the related notes and other supporting material remain accessible on the site, changes in syllabus in response to student interest when allowable can require very little additional preparation time. Most students appreciate this flexibility and often react with increased interest in the course as a whole.

The detailed syllabus can be made more useable by including links to related pages elsewhere on the site as well as relevant references to the textbook or other traditional resources including sample programs where applicable.

Notes

Lecture notes often make up the bulk of the information available to students on a web site and when the site is used to augment a traditional course this is appropriate. Some notes are stored in the form of slides or slide shows that mirror lectures and instructors that typically use slides as the basis for their lecture discussions can make them available from a web site with relatively little overhead. Others provide a rich additional resource that not only mirrors the lectures but also provides additional commentary and supplementary notes they may not have time to cover in class. Notes made available on the course web site should ideally provide sufficient information so that students can use them during class to avoid having to write extensive notes while trying to listen and learn at the same time. These notes will also allow those who miss a class to refer to them in order to catch up on what they missed. On the other hand using these notes exclusively and lecturing directly from them may leave students feeling that the lectures are redundant.

When developing notes to be added to the web site it is again important to keep in mind the kind of facilities to which the students have access. If they are restricted to the use of high-speed line printers thought must be given to ensure that notes printed in this form remain useful.

Assignments

Many instructors use the web to post assignment specifications. One of the tremendous advantages of pages on the web is that they can be internally linked (to other places on the same page) allowing students to locate pertinent information quickly. Students sometimes complain that details regarding a particular requirement of an assignment were missed and while it may never be possible to force students to read everything they've been asked to read it is possible to make it easier for them to find what they need. If the assignment description is long (something that might normally span several printed pages) one can easily place a brief list of the "highlights" at the top of the page and have these linked to the appropriate place on the same page where this information is located. However, some information normally included on a handout describing an assignment (such as deadlines) may best be left in a more central location off the assignment page that can still remain convenient for the student by providing a link from the assignment to the main page or outline where this other information now resides.

Assignment specifications can be linked to supporting notes and exercises as well as back to the relevant "lecture" notes and other pages, including those from other sites. In a course where the assignments change from semester to semester all assignments can be stored in a series of subdirectories. As long as all assignments remain consistent in terms of layout switching from one to another can be as simple as updating a few of the major links.

Reference

To complete the site a reference page should be included. This is where links to other sites can be placed and should be sorted by category or topic. Traditional sources such as books can also be listed here with a link to the publisher and a short critique explaining why this reference was chosen may be appropriate. Finally a glossary with definitions appropriate to the level of expertise of the students and links to the word's first completes the site.

Conclusions

While the initial overhead involved in transferring material to a web site can be considerable it does eventually pay off both in terms of time and effort. Most students appreciate the convenience of 24-hour access to notes and other information. It also moves them one step closer to self-sufficiency with regards to computer use. They are after all going into the business of information manipulation and so a web based support site seems a natural.

References

[BECK00a] Becker, Katrin and Melissa Beacham, A Tool for Teaching Advanced Data Structures to Computer Science Students: An Overview of the BDP System, Research Report 00-653-05, Department of Computer Science, University of Calgary, Calgary, Alberta, Canada.

[BECK00b] Becker, Katrin, Web site for 1st year Introductory Programming course **http://www.cpsc.ucalgary.ca/~becker/231**

[BECK00c] Becker, Katrin, Web site for 3rd year File Architecture course **http://www.cpsc.ucalgary.ca/~becker/461**

[CORD91] Cordell, B.J. (1991) A study of Learning Styles and Computer Assisted Instruction. Computers in Education 16(2) 175-183

[ROSS98] Ross, Jonathan L. (1998) On Line but Off Course: "A Wish List for Distance Educators" International Electronic Journal For Leadership in Learning 2(3)

[WILK97] Wilkinson, Joel and Jonathan L. Ross (1997) "Conceptualizing and Evaluating the Tri-Modal Model for Web-Based Distance Education, On-line: **http://rehab.educ.ucalgary.ca/people/media_learning_systems/my_html/trimodal.html**

General Reference

Rosenfeld & Morville, Information Architecture for the World Wide Web, 1998, O'Reilly ISBN 1-56592-282-4