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ABSTRACT

This paper offers guidelines for developing class Web pages and integrating their use into college courses. It notes that this has been simplified since teachers no longer need to know how to program in HyperText Markup Language (HTML), but teachers still must understand the hypertext medium as well as established pedagogical principles. Specific suggestions are offered for four web-based documents: the class yearbook, the class bulletin board, the syllabus, and class notes. The yearbook and bulletin board demonstrate how the Web can be used to improve communication among class members. The web-based syllabus can improve professor-student communication and provide other benefits such as allowing students to preview the syllabus prior to registration, allowing easy ongoing revision, and allowing easy linking to related information. Finally, publishing class notes on the Web is seen as a way to improve student learning by taking advantage of such Web features as low cost, multimedia format, revisability, building on the work of others, integrating course material, and individualizing instruction. This paper's final section offers suggestions for getting students to use the page. These include using rewards, attracting interest, and updating the page frequently as well as making the site user-friendly. (DB)

Using the Web to Improve Instruction

Running head: TECHNOLOGY AND TEACHING

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Abstract

Teachers can now create web pages without knowing how to program in HyperText Markup Language (HTML). However, creating effective educational web pages requires an understanding of the hypertext medium, as well as established pedagogical principles. This article presents suggestions for: (1) using web-based class rosters and bulletin boards to improve class cohesiveness; (2) using web-based syllabi to promote professor-student communication; and (3) using web-based class notes to increase student learning.

Using the Web to Improve Instruction

Teachers initially faced two major obstacles in producing effective web pages. The first was learning HyperText Markup Language (HTML). The second was appreciating the strengths and weaknesses of the web as a publishing medium.

Fortunately, the first obstacle has been removed. Computer programs that convert word processed documents into HTML, as well as so-called HTML editors, have automated the production of HTML code. Consequently, teachers can now create web pages without knowing HTML.

This article attempts to remove the second obstacle, failing to appreciate the strengths and weaknesses of this new electronic medium. Teachers must realize that the web can be used for much more than translating printed documents into electronic ones. Once teachers fully appreciate that the web can be an interactive, hypertext, and multimedia environment, teachers will be able to use the web to improve class cohesiveness, professor-student communication, and student learning.

To illustrate how the hypertext, multimedia nature of the web can improve a course, this paper will focus on the value of four web-based documents: a class yearbook, a class bulletin board, a class syllabus, and class notes. The yearbook and bulletin board are included to show how the web can be used to improve communication among class members. The syllabus is included to demonstrate how the web can be used to promote professor-student communication. Finally, web-based lecture notes are discussed to demonstrate how the web can be used to help students learn and think about course material.

Improving Class Cohesion: The Class Yearbook and Bulletin Board As mentioned before, the web can be used for more than translating existing documents into electronic form. Indeed, the teacher can use the web to produce documents that would have been impossible to produce any other way. For example, the web makes it easy and inexpensive for professors to publish class yearbooks that contains each student's name, color

photograph, and email address. Students can then use the yearbook to become more familiar with their classmates. Consequently, students should be more likely to engage in course-related discussions both in and out of the classroom.

Another document that facilitates class cohesion and that is difficult to produce without the web is a class bulletin board. Like the grade school bulletin board, a computer bulletin board can be used to highlight important ideas and recent events in a visually attractive way in a central, accessible location. However, the computer bulletin board is more versatile. On the computer bulletin board, students can post questions, answers, comments, class notes, photographs, video, and music; they can submit links of interest; and they can form study groups. There is almost no limit to: (1) the type of media they can put on the computer bulletin board; (2) the amount of material they can put on it; and (3) the time or place from which they can access it. They can access it after midnight from thousands of miles away.

Improving Professor-Student Communication: The Web-Based Syllabus The value of infusing the web into your course goes beyond creating documents that are not typically associated with college classes. Indeed, the greatest benefits may come from converting traditional class documents to web format. To illustrate, consider the syllabus. Its effectiveness is often limited because students may:

1. not have access to it until the first day of class;
2. lose the syllabus;
3. have difficulty keeping track of revisions of the syllabus;
4. not readily find the information they want;
5. find that the syllabus lacks the depth of information they need;
6. find that the professor rarely refers to the syllabus after the first day of class;
7. find the syllabus of little use for helping them contact the professor.

The Web based syllabus avoids these problems. Specifically,

1. students can preview the syllabus before registering for the course;

2. students can't lose the syllabus;
3. the professor can seamlessly revise the syllabus. The ability to revise is particularly appreciated when a professor changes the instructions to an assignment in response to a student's question, when a professor must cancel class, or when the professor changes the exam date.
4. rather than reading the entire syllabus, students can click on links that send them directly to the information they want at that moment ;
5. because students can choose which links to follow and because there are no duplication costs, the professor can go into great detail without overwhelming students with unwanted information. For example, if the professor is describing an assignment, the professor can include links to sample papers written in previous semesters. Similarly, the professor can provide a set of links so that students can learn as little or as much about the professor's interests as they desire.
6. the professor can frequently refer to the syllabus during the course of the semester, merely by creating a link from an announcement or the day's class notes to a particular section of the syllabus. Indeed, rather than being an isolated element, the syllabus can be the gateway for all the course information, including class notes.
7. the electronic syllabus gives the student immediate, constant access to the instructor. All the student has to do to contact the professor is click on an email link. Whereas the traditional syllabus might give the professor's office hours, the web-based syllabus could be used to meet with the professor during "electronic office hours."

Improving Student Learning: Web-Lecture Notes Putting the syllabus on the web can help professors communicate the goals of the class and clarify course requirements. However, most professors are probably more interested in communicating and clarifying

course material than explaining class procedures. Therefore, professors should be even more interested in putting their class notes on the web.

Unfortunately, not all professors who express a desire to put their class notes on the web understand the value of using the Web as a medium. Indeed, after hearing of the difficulties of putting their notes on the web, some opt instead for putting a copy of their notes in the library. Others put their notes on the web, but their notes have the same format as duplicated notes. Both groups of professors apparently fail to understand that there are at least six advantages to web-publishing one's notes over photocopying:

1. lower cost;
2. multimedia;
3. revisability;
4. building on other's work;
5. integrating course material; and
6. individualizing instruction.

Inexpensive The most obvious advantage of using the web instead of a photocopier is expense. Electronic printing is essentially free. Consequently, the professor can be quite inclusive when providing materials. Indeed, an entire classes' worth of sample papers could be put on the web. In addition, color pictures, overheads, and photographs that would be prohibitively expensive to photocopy can be distributed for free.

Multimedia The web can also be used to distribute material that cannot be photocopied. For example, short animations, video and audio clips, computer tutorials, and PowerPoint® presentations can all be published on the web.

Revision Another clear-cut advantage of putting class notes on the web is the ability to revise instantly. Recent discoveries, announcements about upcoming, relevant television shows, as well as student questions and comments, can be incorporated into web-based class notes.

Building on Other's Resources Another, often unrealized, benefit of putting notes on the web is that the professor can link to what others have done. Linking to other people's demonstrations, tutorials, and resource lists exposes students to the best of what the web has to offer and can save the professor time.

Even if a given site does not offer much above what the professor has already said, linking to such a site may be worthwhile. It allows the professor to repeat a message without appearing repetitious. Furthermore, research indicates that hearing the same argument from a different source produces attitude change (Harkins & Petty, 1987). Thus, even if a site merely includes advice that you have given about how to study, you may find it useful to link to that site.

Although links to redundant information can be helpful, perhaps the most useful links are those that allow the student to explore a topic in greater depth. Such links allow the students whose curiosity has been momentarily sparked to act on that spark before it extinguishes. In contrast, in the traditional, web-less class, students must go to the library, look for the books and articles, hope the books or articles are available, choose one of interest, check it out or copy it, and then read it.

Integrating Course Material Yet another, infrequently realized benefit of web-based notes is to make connections between information more salient. At the most basic level, web-based glossaries can provide links to related terms. At a more sophisticated level, links can connect current material with previously presented material. Thus, information on history and research methods that is often discussed at the beginning of the introductory course could be revisited. For example, a lecture on perception could be linked back to an earlier lecture that introduced the structuralist and gestalt schools. Similarly, a lecture on behavior therapy could link back to a lecture on learning; and a lecture on schizophrenia could link back to a section on a theme that was carried through the course, such as "the nature/nurture debate."

Integrating the curriculum Not only can the professor use links to make interconnections within the course salient, but the professor can also use links to make connections between courses more salient. For instance, the professor could link material from the statistics class to material in the research methods class and vice-versa. Similarly, prerequisite courses (research methods to statistics) or between other courses that are ostensibly linked in some way.

Individualizing Instruction Finally, by choosing which links to follow, students experience their own, individualized set of notes. Students can elect to see a concept map of the material, an additional example, another visual, or even another lecture on the topic. They can take sample quizzes. A mouse click allows them to indulge their intellectual curiosity by exploring links to other teacher-selected resources or emailing selected researchers.

Getting Students to Use Your Page

The web can be an effective instructional tool. However, it is only effective if students use it. Initially, you will need to spend class time showing them how to access the web. Later, when you expect them to check the web outside of class, some students will object. They will say that they do not have time to go to the lab. Even those who do not object, may not check the web.

Use Rewards During the first half of your course, you will probably have to use extrinsic incentives to get them in the habit of referring to your page. For example, extra credit assignments may be posted on the web, answers to "pop quizzes" may be posted on the web, and students may receive extra credit for finding interesting links (Santoro, 1997).

Attracting Interest Beyond explicit extrinsic incentives, you can make your page more attractive by linking it to career services information, psychology-related clubs on campus, throwing in an occasional animation, allowing students to conduct library searches from your page, and providing chat rooms or bulletin boards.

"Newness" To ensure continued use of your web page, you must plan on revising it. Unlike a book or journal article, the page must be updated continually. Not only will your students expect change, but changes may be necessary as the sites you link to evolve, change address, or disappear. To plan for revision,

1. develop a system that allows you to update the files yourself, without going through an intermediary. Ideally, you should be able to update files from your home computer.
2. have a student assistant or student volunteer help you. Much of your revisions can be done as well or better by a student assistant. Indeed, much of your web page could be done as part of a class project.
3. develop a way of dealing with the fact that your links to other people's files may become obsolete. Santoro (1997) recommends going on the web and locating a page validation service. These services will check your page's links for no charge. Alternatively, you could assign a student to check links or you could buy a computer program that will check links.

User-Friendly Need Not Be an Oxymoron In addition to updating your site, you will probably need to revise it to make it more user-friendly. User-friendliness starts with helping students get acclimated to the web environment. To help students adjust to the internet environment, you may add a link to a page that lists lab hours and locations, as well as a link to basic information on how to use the internet. After making the web seem more user-friendly, you should focus on making your particular site more friendly by: (1) making it easy for students to navigate through your site without getting lost and (2) reducing the time students have to wait for your pages.

To aid navigation, you will probably find yourself adding links to each page. For example, you will probably need to add a "back to main page" button to most pages, and "go to top" links for long pages. In addition, you may need to add the equivalent of "You are here" signs by displaying the page's name at the bottom of each page. To further help

students navigate your web page, you may change your table of contents from a list of items to a table of items.

To reduce the annoyance caused by long loading times, you may need to reduce the size and the number of colors of a desired graphic-- or eliminate it. To speed up delivery of your page, you may also have to eliminate any video and sound that you had. Finally, even if the sound doesn't take up too much room, students may inform you that the sound you thought was cute is, especially after repeated exposures, annoying.

From Your Computer to Your Students

Once the web page is designed, the question is how to distribute it. In one sense, the ideal solution is to use a server. However, a professor may decide not to hassle with maintaining a server or with working with computer services. A good alternative is to put the files on disk and then load them onto a laboratory computer. By putting the material on the lab computer, you:

1. have many of the advantages of the internet;
2. can more easily restrict access to materials;
3. can better monitor students; and
4. greatly reduce problems due to real and alleged (a) poor internet connections and (b) incompatibilities between student machines/software and your computer system.

Admittedly, rather than loading the diskettes onto the lab computer, you could simply give the diskettes to your students. However, giving the diskettes to students would negate many of the advantages of using the web, such as the ability to revise quickly and the ability to promote both professor-student and student-student interaction.

Finally, you can simulate the web for class presentations. The professor can effectively simulate the web by using the "open file" command and by copying web sites of interest using the "View Source" command or a tool such as "Web Whacker®." The professor can thus present a multimedia presentation that has more hypertext than most

multimedia presentations. Because the material is linked, the professor can ask the students which topics they want to cover and the professor can have instant access to all class materials, including lectures given two months ago.

In making such a presentation, conform to these three principles of effective visuals (Shapiro, 1994). First, the type size should be at least 24 point. Second, the background has to be right for the lighting in the room and for the color of the text. Third, do not present too much information too fast. Fortunately, your browser can instantly adjust the type size to make it bigger, as well as change the background color. Unfortunately, the browser cannot automatically slow down the pace of presentation. However, incorporating frequent quizzes can help slow the professor down.

Conclusions

The web can be an effective presentation tool, but its strength may be as a previewing, reviewing, and communication tool. To make the best use of the web, realize that its uniqueness stems from two facts: (1) it is a hypertext medium--that is, information on the web can be linked; and (2) it is a novel medium.

A professor's skillful use of links can facilitate learning and thinking. The professor can use it to help students follow their curiosity. The professor can individualize instruction allowing students to choose which links to pursue. Thus, students can choose whether to take quizzes, go through tutorials, see visuals, animations, simulations, or additional examples. The professor can promote the ability to see multiple perspectives by linking pages to the pro and the con sides of a given debate. The professor can have students exercise the ability to evaluate spurious claims by linking to pages that make such claims. The professor can use links to show students the interconnections between the course material and even connections between the course material and that of other courses.

The fact that it is a novel medium may account for its popularity. Many students spend hours on the web each day. The web gives you a medium for reaching those students. The new medium gives the professor a new way to reach students and this new

way results in more communication within the class. Email links to the professor in the syllabus, email links to other students through the class roster, and chat systems providing virtual office hours prior to exams make both the professor and classmates more accessible. The increase in communication to the professor is dramatic, sometimes to the point where the professor feels overwhelmed.

Although the web can supplement the teacher, it doesn't replace the teacher. As Santoro (1997) points out, portable information delivery systems have been around for a long time--they are called books! Furthermore, as Socrates pointed out, the best teaching is through inspiration, example, and personal involvement. Each teacher will have to determine how the web fits into the mix of instructional techniques they use.

Indeed, the professor may legitimately wonder if the web even supplements current instruction. It is difficult to monitor student's web use. Even if students access web pages, they may browse (skim) rather than read web pages. There is much misinformation on the web. Time used to adjust to the new medium and technology could have been used to learn course material. Most disturbingly, there is little evidence that using the web improves student learning

Finally, from a professional standpoint, the professor must consider the perils of putting information on the web. All errors in one's notes are there for the world to see. Furthermore, material that might fall into the category of "fair use" if it were used in the classroom becomes a clear copyright infringement when posted on the web.

In conclusion, using the web is not a panacea. However, the professor can use the web to:

1. increase the extent to which students discuss class material;
2. give students a ready avenue for pursuing their intellectual curiosity;
3. give students a way of previewing as well as reviewing class material;
4. give students the ability to choose how many and what type of examples they want to see;

5. make interconnections between the material in the course more salient; and
6. foster students' ability to see multiple perspectives as well as to critically evaluate claims.

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