

Cybertools for Instructors: Using the Internet and the World Wide Web to Enhance Learning in the Classroom¹

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INTRODUCTION

The population of Web users was estimated at 37 million in the United States and Canada (16.6% of adult population) at the end of 1995. Like any new innovation on the market, organizations will take various amounts of time to assimilate this new technology [1]. Web users already include executives, professionals, and others from all industries, special interest groups, families, government, and nonprofit organizations. The proliferation of interest in and the development of web resources, by and for mainstream America, means that the knowledge required to effectively navigate and use web resources will become an expected skill for graduating students in the near future. Organizations need knowledge workers more than ever and, in the face of rapid changes, may not be able to afford the time required to train new employees. Clearly, the basic set of technological skills expected of students entering the job market has evolved over past decades from typing to the use of personal productivity tools like word processing, spreadsheets, and databases. Students are now expected to be familiar with computer networks. If usage trends are any indicators, students will be expected by future employers to have developed proficiency in accessing and using Web resources. A recent survey suggests that 90% of companies with a portfolio of \$350 million and over include the Web as a strategic component of products and services that they have to offer [2].

Two questions motivated us towards doing this research project. First, how can educators help students develop their Web skills? Second, can and does the use of virtual learning environments, such as the Web, enhance students' learning in the classroom? In schools

around the country, faculty and staff have begun scrambling to learn and develop their own Web skills. They have begun to incorporate the use of Web resources into their course curricula. As with the development and use of any new type of instructional materials, it is important that educators also begin to assess the effectiveness of these electronic tools in supporting and enhancing students' learning. This paper reports on a preliminary effort to assess the use of Web resources on student learning, motivation, and interest. The purpose of this paper is threefold. First, we use our own and colleagues' experiences with the Web to discuss ways that electronic resources on the Internet can be used to supplement and enhance traditional classroom instruction. Second, we offer a preliminary analysis of both instructors' and students' evaluations of the effectiveness of these tools based on selected criteria. Third, we conclude with a discussion of potential benefits, inherent costs, and ethical issues of using Web tools in the classroom.

ENHANCING THE LEARNING PROCESS IN CLASSROOM ENVIRONMENTS

As an educational tool, there are at least two ways that Web resources can enhance learning in the traditional classroom environment. First, obtaining electronic information on the Web requires students to interact with the technology and information that are presented. Students take an active part in the learning process by controlling both the content and format of the information presented on the screen. This active participation through usage of the Web is similar to other traditional active learning techniques such as the case study method, where students must "control" the content and format

¹An earlier version of this research was presented at the Information Systems Education Conference (ISECON) in November 1995.

²Results of a Nielsen Media Research study for Commerce Net published in the Washington Post of October 31, 1995.

of the information presented during class [3,4,5]. A meta analysis of 176 studies conducted by an independent consulting firm found that students from preschool through college improved their skills significantly when going on-line and using interactive software and programs at their own pace [6].

Second, using Web resources can enhance learning through the use of multiple media for information presentation (integration of text, graphics, audio and video). In a comment on how children learn, educator Howard Gardner suggested that children require "multiple entry points" for learning, because they "don't all learn in the same way; they don't all find the same things interesting" [7]. Gardner [8] has also done extensive research demonstrating that there may be as many as seven different kinds of intelligence: linguistic, logical-mathematical, spatial, bodily-kinesthetic, musical, interpersonal and intrapersonal. Traditional reading sources of information use only linguistic intelligence, while learning through multiple media allows students to process information through multiple intelligences.

The notion of learning through multiple senses did not begin with multimedia technologies. Memory researchers have known for a long time that the more senses we incorporate into the learning process, the more fully we retain information. There are many popular books available teaching people how to incorporate multiple senses into the learning process through the use of imaginary, vocal, and visual techniques [9,10,11,12]. What is revolutionary is the incorporation of interactivity and multiple media into classroom-based instructional environments.

CYBERTOOLS AND THE CURRICULUM: EXAMPLE OF DATA COMMUNICATIONS

Both authors are involved in teaching introductory data communications courses at two different universities on the East Coast of the United States. One school (school "A") is in southwest Florida, the other (school "B") is an urban school in New York City. After several years of traditional lecture formats, we both made a transition to using the Internet and incorporating Web resources as educational tools to supplement and enhance the learning of data communications concepts in our classrooms.

Facilities at School A include several personal computer labs with Internet access. The Web can be accessed on some of the available stations, which have Windows and Netscape software. It can also be accessed from one of the UNIX workstations with Mosaic software. While many workstations are available to students, the labs tend to have high occupancy and wait time during peak periods. All students can also connect to the university if they own a personal computer and a modem. Speeds available for remote connections range from 2400 to 28800 bps. Students accessing the Web remotely can use a text only browser (Lynx) on their UNIX account or acquire a slip/PPP that allows them to use graphical browsers. All students majoring in Information Systems have the possibility of requesting a UNIX account.

Facilities at School B include an IBM host running the VM operating systems which is used to provide electronic mail (iemail) for the school. Students obtain email accounts at the request of the instructor. In addition, Internet access is provided at various facilities from more than 450 workstations on several

LANs, with about 100 of them equipped for multimedia applications at the library. Both Netscape and Mosaic are available for Web browsing, and other Internet clients are available on the LANs (ftp, gopher, telnet). Access to VM email accounts from LANs is via Eudora mail.

The authors collaborated in preparing assignments for students, lecture notes, and have exchanged other information relating to course material. Therefore, course objectives, outlines and texts were the same for undergraduate classes at both schools. All of these were different for the graduate class at School iBi. On the other hand, each instructor had some of her own requirements. For example, the instructor for School iAi required students to communicate via email for all assignments, whereas the instructor for School iBi did not. Since these projects were done over two different semesters, students did not communicate between the schools. However, in a more recent semester we did pursue further the collaborative teaching opportunities offered by the Internet, and had instructors and students communicate with each other between the two schools for specific projects.

INTERNET AND THE WORLD WIDE WEB

There is almost an infinite variety of resources available on the Internet. One suggested categorization of these resources [13] is: 1) information technology tools; 2) human expertise and perspectives; and, 3) information resources. Following is a brief summary of how some of these Internet and Web resources can be used to enhance students' learning experience in the classroom.

Information Technology Tools

Using file transfer software and a modem, many types of information technology software tools can be downloaded for installation and use on students' computers. Known as "shareware", some of the available programs loaded in public directories at server sites around the world include utility programs (like antiviruses, screen savers, addons, and video clips, sound bites or graphical images viewers); application programs (like email, personal productivity tools, graphical user interfaces to other programs, CASE tools); games; communication programs (like file transfer and terminal emulation programs, Internet protocol drivers); and tutorials and on-line handbooks.

In the courses used for this study, students are taught the fundamentals of data communications. By working with them to obtain access to the Web through campus networks or through dialup access from home, many of these fundamental concepts can be demonstrated, including client/server architectures, Internet protocols, message handling services, file transfer, and terminal emulation.

Human Expertise and Perspectives

The virtual learning environment of the Internet and the Web is best demonstrated through the sharing of expertise and perspectives across time and space. Geographical location of the participants in a virtual learning environment has become irrelevant, as students can share information and insights with others around the world. With respect to the "boundaries" of time, there are two communication modes whereby expertise and information can be shared on the Web: synchronous and asynchronous communication.

In synchronous ("real time") communication, students can participate in on-line discussion groups known as chat sessions. This is the electronic equivalent to a telephone conference call. Dialogue typed by one user is visible on all users' screen. Given the lack of time available to cover course material, we decided not to establish student chat sessions for the semesters reported here.

For asynchronous communication, there are two ways that students can communicate with others: through newsgroup subscriptions and email. A newsgroup subscription is similar to a magazine subscription, except that all participants who subscribe to the newsgroup can also become contributors by posting messages and responding to messages. A newsgroup is like an electronic bulletin board system. A newsgroup can be created for each class, and students can post notes and conduct discussions on topics of interest to the class. In order to set up a newsgroup, ownership privileges and an Internet address have to be set up so that all students can access a particular file on the server. Alternatively, this can be done directly on a Web page. Because this concept can also be fairly easily emulated via distribution lists and email, we decided not to set one up.

The easiest and most useful Internet resource, from both the students' and instructors' perspective, is the use of email. At both schools, students were provided with email accounts. They were encouraged to use email to communicate in general, including discussing problems or questions with the instructor, or sharing information on group projects with other students. In order to get them past the initial fear of the system (e.g., "will my mail get there?"), the first assignment given early in the semester requires students to sign on, view an email message from the instructor and respond by selecting the "reply" function. After this initial step, all assignments in school A are sent via email and students are required to turn them in using the same medium. In school B, students use email to write to each other about their team projects and for general communication purposes. Also, many students are from other countries, and use their Internet addresses to communicate with friends and family overseas.

Using email has many potential benefits. On the one hand it is an easy way to get students on the computer. It also helps them think about telecommunications, especially if they use their computers from home to connect to the university. Also, by using email early in the semester, we are able to refer back to their experiences with email to explain concepts in data communications: modems, transmission concepts, coding schemes, data link protocols, security and data integrity issues. Finally, using email also helps students visualize the underlying architecture of the Internet.

Information Resources

The term World Wide Web most aptly describes the efficient graphical user interfaces available for accessing information resources on the Internet [14]. The efficiency of accessing information via the Web is in great part due to the way that the information in two different files can be linked using hypertext transport protocols (http). Hypertext is generated through coded commands embedded in the text and called hypertext markup language (HTML). Using a Web browser, one can view a highlighted section of text that, when selected with the cursor or mouse, will link the user to a file that may be located on another computer (server) in any part of the world. Using Web browsers, a student can navigate through a globally distributed

information storehouse by following simple pointers from one hypermedia document to another [14,15]. Most students are surprised and delighted with the vast array of entertaining and informative information accessible using graphical Web browsers like Mosaic and Netscape, or Lynx (text only). Incorporating the Web into course curriculum can be accomplished in several stages.

Introductory stage: navigation

Students can be provided with some interesting Web pages to begin their browsing. They quickly grasp the navigational possibilities using hypertext links, and they begin exploring the Web on their own. A good way to generate enthusiasm and share information is to have students report back to the class on their favorite Web page locations. Page locations are known as Universal Resource Locators (URLs), and are generally in the format

`http://www.some.address.domain/directory/subdirectory/page.html`.

Another interesting Web browsing activity is to create an on-line treasure hunt where students must find answers on the Web. Learning through Web navigation is revolutionary in the sense that, rather than the teacher shoving prestructured knowledge in a fixed format at the student, the student is interactively designing his/her own knowledge structure. The process of learning is under the student's control, not the teacher's. At this introductory stage, the goal is to have the students discover, on their own, the global nature of the information repository on the Web. Once they recognize its potential, students can investigate a particular topic or problem using the resources available on the Web.

Intermediate stage: course pedagogy

The second stage of potential usage of the Web is for dissemination of pedagogical materials. The instructor can provide all information related to the course via a Web page and can include a "mailto" function, which allows students to generate an email message back to the instructor. The instructor could even build one page per lecture which would include class notes, notices, assignments, cases, tutorials and even videos and slide shows for students to view during class and review when needed. There is the issue of students not coming to class. We believe that our students being seniors or graduates should be responsible enough to know when they need to attend. Ultimately, if they understand all the concepts, perform well on team projects and obtain good scores on examinations, it may not be so crucial to control attendance. Finally, an additional benefit of developing course material using hypertext is that an instructor can link tutorials and case studies developed by others onto the course page.

Advanced stage: Web development

Students who are comfortable with the first two stages are ready to begin designing their own Web pages. There are many tutorials, manuals, and other documentation available on the Web for helping students to design their pages. Features of a typical Web page include the use of icons (graphical symbols), digitized photos, and other graphical symbols. Using HTML, students learn how to embed links to graphical images within their text, and if time and equipment permits, they can use scanners to digitize their own logos, icons, and images. This is also a good time in class to cover topics such as security, ethical and legal issues. In total, only one lecture needs to be

spent on building pages to teach them the basics of HTML. This is where skills learned in the first stage (like FTP) can be used to obtain what students wish to incorporate in their own pages.

Ultimate stage: collaborative teaching

Collaborative teaching can be accomplished in many ways. First, we can use colleagues from other parts of the country or world to act as mentors on class projects the instructor assigns. For example, one of the authors evaluated project ideas and ongoing page development for students at another university. Another example would be to have students do independent studies with members of advising committees at remote universities. Second, projects can be assigned simultaneously to two classes, where students can view and share ideas via Web and email, and where instructors can coordinate and team teach. We are currently establishing guidelines for such a project. Third, remote group exercises can be set up where students from different locations are assigned to teams and all communication is done via email with instructors supervising the exchange. Finally, we can simply have instructors share experiences, syllabi, exercises and other teaching material and tricks via email, listserv, or web pages. This phase is well under development in many parts of the country and the world, with many instructors sharing their knowledge and use of new tools with others.

THE WEB SURVEY

In order to investigate the impacts of the use of these resources, an anonymous questionnaire was given to four classes of students taking business data communications. The first two classes were from School A during a spring and a summer semester. The third and fourth classes were from School B during the following fall semester. For classes A1, A2 and B4 students were undergraduates completing the last year of their bachelor of business degrees in Information Systems. The course was an elective which could count toward a concentration in distributed information systems. Class B3 was composed of graduate students. Table 1 provides some general demographic information on the classes. The population of students at School B who participated in this study varied in the level of Internet resources they were introduced to. While some sections were only taught to use email, others were trained on Web browsers and other Internet resources. In addition, some sections were taught how, and given the opportunity, to develop web pages.

The objectives of the questionnaire were: 1) to evaluate the extent of students' use of the Internet, the Web and related resources; 2) to obtain their opinion of the educational value of those resources; 3) to investigate their motivation to keep up their learning via the Web and the Internet after their current course; and 4) to get their overall satisfaction or feeling about how much their experience with the Internet and the Web resources enhanced their learning over the semester. Space was also provided for additional comments and suggestions. The questionnaire contained more questions than what is reported here.

We think that self-assessment was the only practical way to proceed. For the Internet, email, and the web, the number of products and their varying functionality is so great that giving a pre and post test on specific products would have been difficult and misleading. For example, many students used several different email packages "BEFORE" the class. Therefore, some of them preferred to use these other SMTP compatible products, like Eudora or Pegasus, for their communication and assignments instead of Pine or Elm on the UNIX hosts, which were demonstrated in class. In these cases, testing students' knowledge on a specific product would not have told us whether the assignments helped improve their knowledge and usage since they never used that specific product. The same thing could be said about knowledge of the Internet, which covers a broad range of tools and technologies. As for the web, students varied in their prior knowledge and use. Some preferred text-oriented web browsers like Lynx, while others liked graphical packages like Mosaic and Netscape.

A second reason for not using pre and post tests is that experiential knowledge is often best assessed by self-report. The goal of the paper was to explore as a preliminary study whether practical assignments using web resources would enhance students' understanding of the course they were enrolled in. Using this as a foundation, we were more interested in students' perception of the value of using web technology in the classroom, than in a standardized assessment of their specific knowledge of web products.

Results

The first set of questions tried to evaluate the relative usage and knowledge of the resources before and after taking the course. Results are presented in Table 2. It can be seen that both knowledge and usage of all the resources increased after the course, sometimes significantly. Noticeably, the increased was larger for Web resources than for email in almost all cases, except for class B4 where similar increases were found for both the Web and email. It was expected that knowledge and use of email would be larger originally given that email has been around for a longer time period. On the other hand, many students commented that it was the first time they had heard of the Web while attending these classes. An interesting result, which we had not intended to measure per se, is the difference of original knowledge and use of the technologies between undergraduate and graduate students. For every category presented in Table 2, graduate students had lower initial usage and knowledge than any one of the three undergraduate classes, even though they answered the survey in the most recent semester. On the other hand, their later knowledge and usage is either similar to the undergraduates or higher.

TABLE 1: DEMOGRAPHIC INFORMATION

		Class A1	Class A2	Class B3	Class B4
Number of students	Females	10 (32%)	9 (43%)	33 (41%)	29 (44%)
	Males	21 (68%)	21 (57%)	48 (59%)	37 (56%)
Age of students	Average	25	31	29	25
	Minimum	21	22	22	20
	Maximum	31	45	49	46
Personal Computer at home	Yes	23 (74%)	18 (86%)	61 (75%)	44 (67%)
	No	8 (26%)	3 (14%)	20 (25%)	22 (33%)

Interestingly, class B3 is slightly different than other classes in that it was composed of a large percentage (80%) of international graduate students. Many of them did not own a computer, and most had no previous experience with network applications. Another challenge that had to be overcome is that for many, English was a second, third or fourth language, and learning a new technology was very difficult.

TABLE 2: BEFORE & AFTER COMPARISON OF KNOWLEDGE & USAGE (SCALE: 1 = NOT AT ALL TO 7 = VERY MUCH)

	CLASS A1		CLASS A2		CLASS B3		CLASS B4	
	Mean	Std Max	Mean	Std Max	Mean	Std Max	Mean	Std Max
INTERNET	3.45	1.74	4.00	1.66	2.59	1.54	3.56	1
Knowledge before class	1	7	1	7	1	7	1	7
Knowledge after class	5.45	1.21	2.38	1.05	5.44	1.04	4.84	1
	3	7	3	7	3	7	2	7
EMAIL	4.77	1.81	5.00	1.90	3.51	1.83	4.56	1
Knowledge before class	1	7	1	7	1	7	1	7
Knowledge after class	6.23	.071	5.90	1.01	5.56	1.31	5.44	1
	5	7	4	7	2	7	2	7
Usage before class	4.35	2.18	4.62	2.01	3.23	2.10	4.16	2
	1	7	1	7	1	7	1	7
Usage after class	6.16	.099	5.81	1.18	5.39	1.53	5.23	1
	3	7	3	7	1	7	2	7
WEB	2.90	1.75	3.67	1.75	2.36	1.86	2.36	1.86
Knowledge before class	1	7	1	7	1	7	1	7
Knowledge after class	5.19	1.28	5.19	1.30	5.76	1.02	5.76	1.02
	3	7	3	7	3	7	3	7
Usage before class	2.35	1.73	2.90	1.92	2.36	1.86	3.11	2
	1	6	1	7	1	7	1	7
Usage after class	5.13	1.39	4.76	1.63	5.70	1.24	4.16	1
	2	7	1	7	2	7	1	7

Since the increased usage and knowledge could have simply been the results of taking the courses, students were also asked to provide their impression of how Web and email handson assignments helped in their increased knowledge and usage. On average, students felt that the assignments did help them understand course concepts. For all classes, Web and email assignments were almost equally helpful. These results are presented in Table 3. We must note that class B4 was not given specific Web assignments, hence any Web usage experienced over the course of the semester was on their own initiative. This may explain the low 2.78 score for Web assignments.

Finally, in order to verify how students ranked the usefulness of the resources, we asked them how much they thought email and Web knowledge were required in today's job market. While they clearly indicated that email was a must, the Web had not gained the same status, although in the most recent semester (fall 1995), the Web started being recognized as a more important skill. This result is particularly interesting in the case of class B4, since they were not given specific Web training and yet, still gave a high score for necessity of these skills on the job market. The results are summarized in Table 4. Additionally, most students (84% for Class B4; 86% for Class A2; 94% for Class A1; 99% for Class B3) said they would like to continue using the Web after the course was finished. Reasons for this included information, research, fun, work, daily news, entertainment, profit, communication, leisure, and more.

TABLE 3: STUDENTS' PRECEPTIONS OF ASSIGNMENTS

(SCALE: 1 = CONFUSED ME; 2 = DID NOT HELP; 3 = SOMEWHAT HELPED; 4 = TREMENDOUSLY HELPED)

How assignments helped understanding of the course	CLASS A1		CLASS A2		CLASS B3		CLASS B4	
	Mean	Std Max	Mean	Std Max	Mean	Std Max	Mean	Std Max
EMAIL	2.94	0.80	3.29	0.70	2.97	0.69	2.98	0.
Assignments	2	4	2	4	2	4	1	
WEB	3.10	0.64	3.14	0.71	3.47	0.60	2.78	0.
Assignments	2	4	2	4	2	4	2	

TABLE 4: PERCEIVED NECESSITY OF SKILLS ON THE MARKET

(Scale: 1 = not at all to 7 = very much)

	CLASS A1		CLASS A2		CLASS B3		CLASS B4	
	Mean	Std Max	Mean	Std Max	Mean	Std Max	Mean	Std Max
EMAIL	6.26	0.95	6.48	0.73	5.89	1.13	5.63	1.
	3	7	5	7	2	7	2	
WEB	4.00	1.63	4.67	1.61	5.58	1.19	5.11	1.
	1	7	2	7	2	7	1	

DISCUSSION

This paper discussed potential uses of the Internet and Web global distributed information repositories as tools for enhancing the traditional classroom learning environment. Both authors feel that there are many benefits to using these vast resources. Students seem to confirm the authors' perceptions, and reacted very positively to the experience. Preliminary results from our studies tend to indicate that students feel their understanding of data communications was improved by the practical usage of the resources. In their comments, many students suggested greater use of practical assignments. For example, class B4 was not given any specific Web assignments, but was aware of other sections that were provided with this training. Many free form comments from class B4 indicate a strong desire for more Internet training. However, there are important issues to consider when planning to incorporate Internet or Web use in the curriculum.

Startup costs

There are startup requirements for using Internet and Web resources. At a minimum, students must have access to an Internet node with an Internet Protocol (IP) address from which they can access the Internet. At most schools, this is accomplished through a mainframe-based host computer, or a UNIX based server on a local area network (LAN). Students need to have a computer account that allows them to have host access for email and the ability to access facilities on the host for file transfer, Web browsing, and other functions. Alternatively, many small, medium, and large Internet service providers operate around the country. Dialup user accounts can cost as little as \$10/month. If students want to design their own Web pages, then they need appropriate storage space on a server that is always running where they can upload their pages. The issue of costs also re-emphasizes the question that many schools are currently trying to deal with it as to whether students should be required to have personal computers (and modems) when they enter a university.

Information Integrity

A major issue with the distributed nature of the Web is that information is maintained by thousands of individuals operating on their own initiative. Students accessing that information may assume that if it's on the Web, then it must be true or valid. Since anyone with a server and an IP address can design a Web page, there is always the possibility that information will inadvertently or deliberately be false, misleading, inaccurate, or outdated.

Ethical, Social, Legal and Political Issues

Electronic collaboration requires the highest levels of integrity, responsiveness, and consideration from students and instructors. If someone doesn't carry his or her load, it can be a disaster. In a physical classroom environment, it's easier for free loaders who just show up and pretend they are contributing, but in a virtual world, non-contributors would be very conspicuous. In addition, students always underestimate the time constraints of instructors' availability when they communicate electronically. Email gives them the impression that they are the only correspondents with the instructor. This can be a problem for large groups of students.

Another serious concern is the nature of intellectual property. Since there is so much information on the Web, and it is so easy to download, students may not understand that copyright violations can occur if they download a copyrighted image to embed in their work. Or they may not understand that if they download information to include in a paper or assignment, they should carefully track and cite all references to that information. There are also moral issues associated with Web use, i.e., on the availability of pornographic, racist, or other socially objectionable material on the Web. When students get to the stage of Web development, this is a good time to discuss all the ethical, legal, social, and political issues involved in this new frontier. As in the Gold Rush days in the Wild West, the Web represents a "gold mine" of information, and the gold rush is on. Amid this flurry of activity, there are actually very few standards (legal or moral) governing the behavior of the participants. And similar to the days of the Wild West, the new frontier is populated by many rugged individualists who would like to avoid all external governance of behavior, but rely instead on individual conscience and personal preferences.

CONCLUSION

The Internet has the potential of reducing gaps in society by providing equal access to information in all countries, in all types of organizations and to people with different levels of technology knowledge [16]. Educators need to be aware of the resources available to them. They also need, however, to understand the impacts of these technologies on students' learning. We have attempted here to provide an initial evaluation of the Internet and the World Wide Web as tools to enhance traditional classroom environment. We believe that there are two main reasons for using the resources. First, we strongly feel and have attempted to show in this paper that learning is enhanced by the use of these resources. Second, students need to be aware of the existence of these resources and must be able to efficiently use them in order to face today's dynamic business world.

Although we recognize the added benefits for data communi-

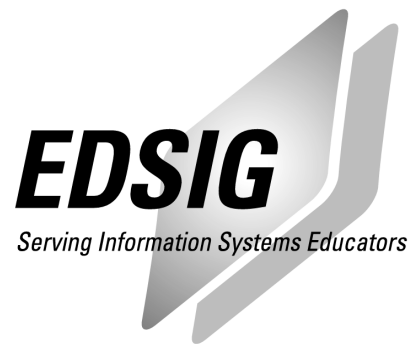
cation classes, we believe that all Information Systems instructors and students would benefit from incorporating these new technologies in the classroom. The various uses of the Internet and the World Wide Web as suggested in this paper can apply to other non-technical classes as well. For example there are a variety of Information Technology Tools which can be downloaded free from the Internet, such as case studies (ex.: Managing Information Systems classes), case tools (ex.: Systems Analysis and Design classes), or even games (ex.: Statistics classes), which can be used by instructors. There are even a large number of handbooks available for download on a large number of topics, even outside the subject matter of Information Systems. As far as using the communications tool like email or newsgroups, it provides students with greater access to their instructors outside normal office hours. It also allows students to communicate with their peers to exchange information. Again, students in every information systems class, even non-technical ones, could benefit from this. Finally, examples of collaborative teaching could be to team teach classes between remote universities or create virtual groups of students from various universities to work on specific projects. Even for non-technical classes, students will have learned information sharing and gain group experience which will be valuable skills for them to enter the job market today. The only caveat here is that there must be sufficient training provided to the students on using electronic mail or other Internet tools used in and out of the classroom. The particular case of web development, when students learn how to create web pages is definitely most appropriate for courses that are either data communications, programming or operating systems related.

The use of Internet and Web resources represents an evolution of the traditional teacher-student relationship. This relationship can now be enhanced for both through a virtual world of almost unlimited resources, a world that is largely self-organized through Web browsing technology and user preferences. This educational evolution allows for individual creativity, it fosters curiosity, and it has untold capacity for sharing information on a global scale. However, like all powerful technological tools implemented throughout human history, it also has the potential for manipulation, distortion, and abuse. As educators, it will be our responsibility (along with parents, business, and community leaders) to research and develop these technologies in ways that respect the rights of others. As educators, we have been using our influence toward these positive ends through face-to-face interaction with our students. In the new frontier, we must be aware that both teachers' and students' spheres of influence, whether positive or negative, are globally expanded.

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ISSN 1055-3096