

Impact of the Web on Economics Pedagogy

<<http://ecedweb.unomaha.edu/ksosin/webteach.pdf>>

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Kim Sosin¹

Introduction

Informed observers of the implications of the Internet and World Wide Web for education usually begin by saying that sweeping transformations will result, but beyond that common beginning lies wide disagreement on the extent and the wisdom of these changes. What form will this transformation take? How extensive will it be? For example, are traditional universities endangered organizations? Will printed books be obsolete? Where are computer and networking technology headed? And, of primary importance to educators, how and to what extent might their roles change? Are there economies of scale to Internet web-enhanced teaching that could eventually put some institutions and teachers out of business?

At one end of the opinion spectrum is James Burke, British television host of the acclaimed program on evolution of technology, "Connections," who says "the next fifty years are going to make everything that went before it look like 'See Spot Run.'" Even in ten years, according to Burke, newspapers, books, and television sets will be replaced by the web (or its successors), while the machines that connect us to networks will be wireless, portable flat-screen pages that are voice-responsive. At the other extreme are the naysayers such as Clifford Stoll (1995, 1996), who asks if computers are a way to avoid learning, which is hard work, rather than a new way to learn. For Stoll, at stake are students' belief in teachers as central sources of information in the classroom, their attention spans and writing abilities. Likewise Stephen Talbot (1995: 347) has provided thoughtful and philosophical views of an expert on the dangers of technologically networked society. "It is not that society and culture are managing to assimilate technology. Rather, technology is swallowing culture."

Faculty members' breadths of opinion on technology are no less encompassing. Some are truly excited with what they regard as a new way to engage students in learning, while the naysayers argue that technology is a time-consuming way to add glitz and entertainment rather than substance to teaching. Many in the latter group also seem convinced that today's newest teaching technology will follow the fate of the TV classrooms of the 1970s into pedagogical backwaters and relative obscurity.

Robyn Griggs (1995), discussing efforts in Colorado to bring technology into teaching, quotes Eric Feder of the Colorado Department of Education on this modern Rip Van Winkle story. If someone fell asleep in the 1880s and woke up today in a doctor's office, he would have no idea where he was. If he woke up on mass transportation such as high-speed train or airplane, he would be terrified. But if he woke up in a classroom, he would feel quite at home. Can the same be said of the "modern" economics classroom? And more to the point of this paper, is that one-hundred year old classroom a fine antique that still performs beautifully or can it benefit from a massive technological facelift?

This paper focuses on three questions about the participation of economics teaching in the Internet/Web "revolution." First, to what extent are departments of economics (in the U.S.) able and willing now to participate in Internet and other computer approaches to teaching economics? Second, for those economics teachers who now use web networks in teaching, what are they doing with Internet/web? Third, what are the pedagogical implications? To answer the first question, survey instruments were sent to about 1000 post-secondary schools with economics departments to find their

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physical readiness to use computer (and distance learning) technology, and to reveal their current and projected use levels of Internet and distance learning delivery of economics.² A copy of the survey questions is included as an appendix. A second, less formal, exploration was done to examine a number of the publicly available economics education and class-based web sites and discuss them via e-mail with their economist-creators.

A third and very fundamental question must be answered as economics teachers develop experience with web-enhanced teaching: how effectively do students learn? Unfortunately, most of the evidence at this time is anecdotal and much of this is at K-12 rather than college level. For example, Dwyer (1996) includes a list of articles that evaluate learning in the K-12 schools, concluding (based heavily on Tierney 1996) that technology, when an integral part of comprehensive plan for instructional improvement, improves students' mastery of basic skill, test scores, writing, and engagement in school.

Little evaluative material on student learning in economics is available because economics teachers have not used this technology long enough to have accumulated a "critical mass" of evaluations. Also, since the economics teachers who currently use the web extensively in their teaching are those most enthusiastic and most experienced at the technology itself, generalizations about its effectiveness for all teachers will have to be interpreted quite cautiously until its use is more widespread. The last section of the paper deals with the evaluation issue.

Teaching Economics Using the Web: Survey Results of Departments of Economics

To use the Internet or web for teaching economics, faculty members and students require access to networked computers and software. Faculty members should have access in their offices for preparation, students need their own computers or readily available computer labs, and for teaching purposes networked classrooms are important. To what extent is the economics profession computerized and networked? A survey done in the fall of 1996 reveals both good news and bad news. Faculty members have a high level of access to computers with some notable exceptions, student access is less extensive, but the classrooms we use are woefully inadequate. Pedagogical use of the Internet and web, at least in economics, is present but not as widespread as the current media Internet hype might imply.

The survey instrument was sent to department chairs of 986 post-secondary institutions offering bachelors and higher degrees. Of these, 325 completed surveys were returned in time for this analysis, a response rate of 33%. Responses to several of the questions are relevant to the issue of Internet and web use by economics teachers. See the appendix for the survey instrument and a summary of all results.

Figure 1 shows that for 56% of the departments surveyed, all faculty members have adequate computers in their offices and in 75% of departments, over three-fourths of faculty members have computers in offices.³ About 18% of the departments have high end computers (Pentium, MAC PowerPC, Sun SPARC, etc.) in every faculty office (not shown). At the same time, about 4% of departments still have no adequate computers in faculty offices and 8% have zero to a quarter of faculty offices adequately equipped.

Figure 1

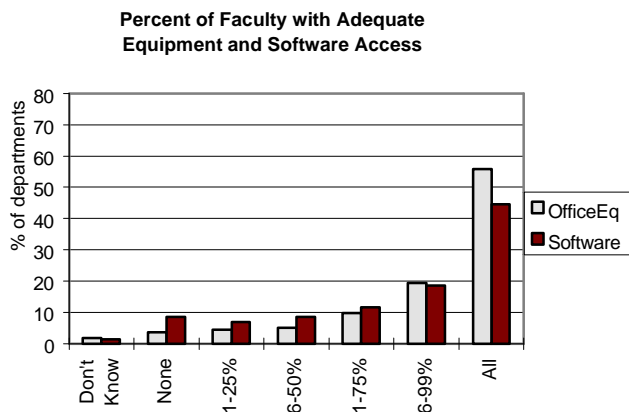


Figure 2

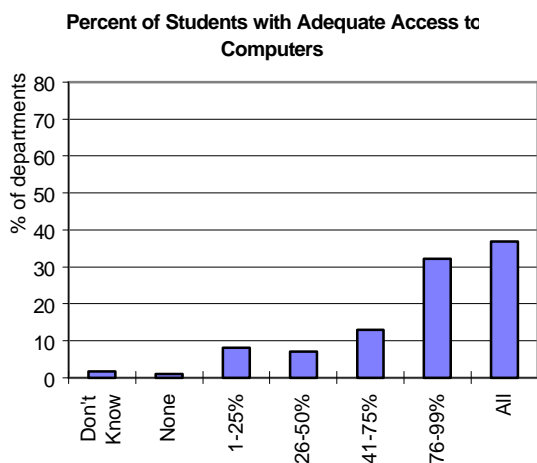
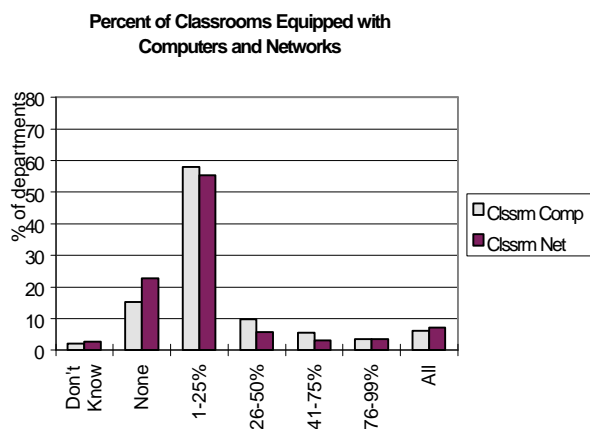


Figure 3



Faculty access to adequate software has a similar pattern, but is slightly lower than access to adequate computers. Only about 45% of departments have universal access to such software; however, 8.5% of departments have no faculty members with adequate access.

Student access, shown in Figure 2, is less satisfactory than faculty access. In only 37% of the departments, all students have adequate access (defined as computers to do what faculty want to assign, not necessarily to do current assignments). However, at the other extreme, only 1% of the schools provide no student access to computers. For those schools with adequate student access, student computer labs are overwhelmingly (87%) the method of provision.

The most effective way to teach students how to use Internet and web access is to use class demonstrations and to use the Internet in classroom teaching. Apparently, few of our economics classrooms are equipped with computers and even fewer with LAN and/or Internet access (Figure 3). Fully 23% have no networked rooms at all for economics classes. A classroom that has no on-site computer might still be used via a “smart cart” or mobile computer cart. But if classrooms are not networked, then significant use of the web for teaching is very unlikely.⁴

Given these facts about equipment access, it is perhaps surprising that classroom use of the Internet in teaching economics, particularly web networks is not uncommon (Figure 4). The use of the web is more popular in classes or for class assignments than the use of listservs, Usenet, or MOO/MUDs.⁵ About half of departments (49%) have some to one-fourth of the faculty involved in web-enhanced teaching and over 70% of departments reported some to all faculty using web networks.

Figure 4

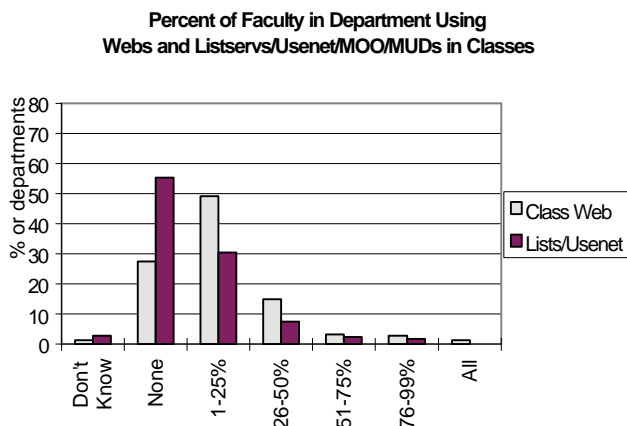


Figure 5

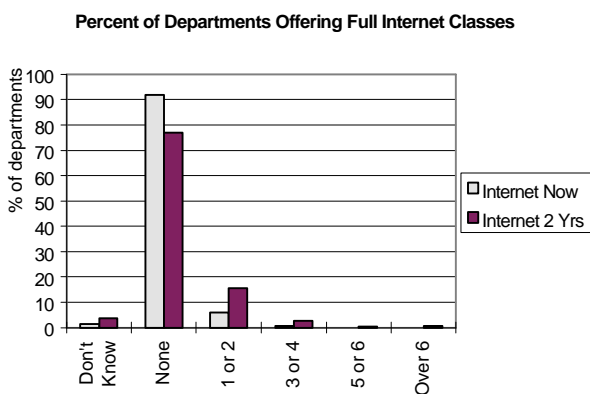
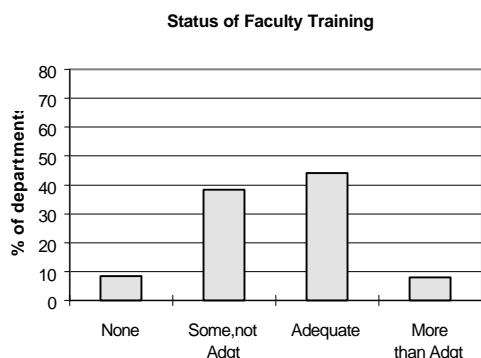


Figure 6



A few departments offer full Internet asynchronous distance education courses (Figure 5). This type of course is not a common departmental offering in economics at present, but if plans are realized, in two years the number of departments offering them will almost triple.

Of the departments returning surveys, 48% have departmental web pages and an additional 20% have web pages under construction. Apparently, the web is widely regarded as an appropriate medium to provide information about the department, even in departments where web use in classes is less common. Unless the department has simply provided information to someone outside of the department for the web page and has no further web privileges, these departments have an important additional benefit: access to a web server. Advanced use of the web in teaching requires at least minimal privileges to place HTML files on a drive that a web server can access.

An important component of faculty use of computers, Internet, and web in teaching, often overlooked in the financing and planning efforts, is faculty training. Figure 6 shows how department chairs in economics evaluate the availability of adequate training in their departments. Forty-seven percent of departments were judged to have less than adequate computer training and another 45% were judged to have adequate training. One of the major frustrations of faculty members related to using teaching technology is that they are often expected to figure out how to train themselves and then apply this training with no decrease in performance of other aspects of the job. These data suggest that economics departments, and probably the institutions they serve, should be investing much more in training if they expect this technology to be used in teaching.

The results further subdivided by type of institution—research, doctoral, masters, or bachelors—in which the department is located, can be quickly summarized⁶. With “research” schools as the baseline, in general but not universally, access and use is somewhat less in “doctoral” schools, further declines in “masters” schools, and finally the lowest level is in “bachelors” schools. Since the size of the schools and departments has this ranking also, it is fair to say that the larger departments are generally more active in technology than the smaller. In general but not always, the resources and budgets of the schools—always a consideration in technology use—also follows the same ranking.

In several cases the differences compared to “research” schools are statistically significant. Both “bachelors” and “masters” schools are significantly less likely to have a departmental web page, and also have a significantly lower percent of faculty with top-line computers. In addition, “bachelors” schools have significantly poorer software access and “masters” schools are less likely to use e-mail, listservs, etc. for classes.

Information was also collected on the college/division (business or other) of the department and if the department was combined with another administratively. Few significant differences were found in relation to these variables. However, departments in non-business colleges use e-mail, listservs, etc. significantly less for teaching than departments in business colleges. Also departments that are combined with other disciplines are significantly less likely to have a departmental web page than departments that are only economics.

Are departments of economics prepared to use technology in teaching? Unevenly. In some departments, faculty and students have access and classes are computerized and wired. In some departments, none of these things are accomplished. In most departments, over half of faculty and students have adequate access and at least one technology classroom is available. At the same time, training is inadequate for over half the departments. Is technology widely used in teaching? No. In most departments, less than one-quarter of faculty members use web assignments or other Internet features in teaching. Though the other survey questions are beyond the topic of this paper, it is worth noting that the survey results with respect to use of multimedia software for teaching are similar to use of web and Internet. Even basic presentation software (Powerpoint, Harvard Graphics, etc.) is only used by one-half or less of faculty members of economics departments.

Using the World Wide Web to Teach Economics

The web can be used in a variety of ways in teaching. In this section, I discuss the types of web sites that have been developed for educational use and some of the myriad ways webs have been and can be used for teaching. Other Internet features, such as e-mail and listservs, will not be included here except as they relate to the web. Additional information about e-mail uses of the Internet can be found in Manning (1996) and listserv uses in Hannah (1996).

The level of access to and knowledge about the web by a faculty member makes a substantial difference in the way the web can be used for his or her classes. Web assignments can be made even if the teacher has minimal knowledge of the web, which could be defined as “how to use a browser and a search engine.” Ability to download and decode files should also be a part of the minimal knowledge needed, which can be quickly learned from the web. If the teacher knows HTML (hypertext markup language) and has access to a web server, the possibilities for taking advantage of the web are much more extensive because documents can be created and placed on the web, i.e., the teacher is not limited to accessing others’ work. HTML tutorials are available on the web (see <http://ecedweb.unomaha.edu/naee/nethelp.htm> for a list of these sites.) and many programs are now available to create hypertext documents with minimal knowledge of the details of HTML, e.g., the

Internet Assistant for Microsoft Word can be downloaded from the Microsoft site <http://www.microsoft.com/>.

Based on the survey results, most faculty members do not use the web in teaching. For some, lack of equipment and/or web access is a basic reason for not experimenting with the web. Those who have the equipment and access either don't have an interest in using the web in teaching (perhaps because they see no pedagogical advantages), don't know how web information could be incorporated into classes, don't have time to develop courses that incorporate the web, or are not comfortable enough with the technology to proceed. These reasons suggest that a discussion of some ways the web can and is being used in teaching must precede any observations of the pedagogical implications. In what follows, I will use the terms "web-enhanced teaching" or "web class" to refer to a class that has both a traditional component (class meetings, discussions, lectures) and a web component. Courses that are offered completely on the web will be called "web-only classes." There are currently very few of these in economics.

Educational Uses Requiring Minimal Web Knowledge

Economists using the web are fortunate to have one of the most thorough and up-to-date web resources publication available in any discipline. Bill Goffe's "Resources for Economists on the Internet" is an on-line publication at <http://econwpa.wustl.edu/EconFAQ/EconFAQ.html> that is thoroughly indexed to all types of economic information available on the web, can be searched by keywords, and is hotlinked to the final web sites. Likewise, George Greenwade has a gopher site gopher://niord.shsu.edu/11gopher_root%3a%5b_DATA.ECONOMICS%5d with a vast number of links to economic information and data. Bob Park's project to provide electronic pre-prints of economics articles on the web is also an important source for students or instructors working on research projects.

Several types of web sites are potentially very useful for all teachers, whether their web knowledge be minimal or expert. Here are some educational uses of the web that require of the teacher only minimal web knowledge, no HTML and no access to a web server.

1. *Acquire up-to-date economic information:* The web has become a wonderful storehouse of electronic text archives and databases. Perhaps the most obvious educational use of the web is to acquire up-to-date economic information. Sources of primary data on the web are quite valuable for students and faculty who are working on statistical or other applied projects. Such sites as FRED <http://www.stls.frb.org/fred/> provided by the St. Louis Federal Reserve Bank, LABSTAT <http://stats.bls.gov/bls/home.html> from the Department of Labor, and the NBER site for international data <http://nber.harvard.edu> should become familiar to all economics students as both the easiest way to collect many statistical series and the only way to collect some data before it is published in hard copy. Instructors also use these sites to assign applied or statistical projects and to get the latest information for class discussions or presentations. Likewise, news sources on the web provide a way to target the category of news desired, e.g., business or financial, and receive articles from several sources on the chosen categories.⁷
2. *Specialty sites for economics faculty or students:*
 - (a) The purpose of some sites is to provide information to assist economics teaching and educators. An example is *EcEdWeb* <http://ecedweb.unomaha.edu/>, which is more developed at this time for K-12 economics education. It also has resources that college teachers might find useful, including an "idea page" linked to the college teaching page for web projects for all levels of education. The idea page links to an interactive self-quiz example with animated demonstrations reviewing demand and supply and also suggests several "WebQuests" involving investigations of the deficit or the system of Federal Reserve Banks.

- (b) Ray Fair, whose macroeconomic model is well-known, has created an ingenious web site that permits simulation of economic outcomes <http://fairmodel.econ.yale.edu/>. For example, during the election this site featured an election prediction based on assumptions about the state of the economy. Although students won't see the actual model, they can see how macroeconometric models permit evaluation of outcomes based on different economic assumptions and investigate some of those outcomes themselves.
- (c) oo_micro is an interactive and animated site for intermediate micro economics teaching. Watch the curves shift as the concepts are presented
http://medusa.be.udel.edu/WWW_Sites/oo_Micro.html.
- (d) On-line journals, web sites of most economics journals, and working papers on the web provide extensive sources of searchable economic papers on all subjects. The working papers or pre-prints provide information before becoming available in print and thus provide faculty and students access to some of the newest ideas and analysis. A few of the many available web sites are
- <http://www.indiana.edu/~econed>Journal of Economic Education
 - <http://www.cba.unl.edu/eced/ncree/reedman.htm>Research in Economic Education Database
 - <http://www.bucknell.edu/~jshackel/iaffe/>International Association for Feminist Economists Web Site
 - <http://www.nuff.ox.ac.uk/Economics/Growth/> Economic Growth Resources
 - <http://www.sims.berkeley.edu/~hal/index.html>Hal Varian's Economics WWW Server at UC-Berkeley (papers on the Economics of the Internet)
 - <http://econwpa.wustl.edu/Welcome.html>Econ-WP: Economics Working Papers Archive at Washington University
 - <http://nber.harvard.edu/>NBER National Bureau of Economic Research Gopher
 - <http://netec.mcc.ac.uk/~adnetec/BibEc/BibEc.html>BibEc Bibliography of Working Papers
3. *Expand and enhance discussion of issues:* Hear from, and even interact with, economics experts via the web. Several sites have “ask the experts” features which involve e-mail to experts initiated by students from a web page. See, for example, the *New Jersey Networking Infrastructure in Education* economy and business page at <http://njnie.dl.stevens-tech.edu/curriculum/economy.html>. Along these same lines, economists analyze current economics news from DJN and key to textbooks by Varian and Stiglitz at the Dow Jones and W.W. Norton web site at <http://www.wwnorton.com/wsj/welcome.htm>. Instructors can readily have their students draw on and critique these analyses to enhance class discussions of current events.
5. *Web-only textbooks and on-line asynchronous Internet/web courses:* Authors and technology specialists are working on on-line textbooks and other published material. Since textbooks and courses are not provided free, the lack of payment method and access restriction that is widely accepted, uncomplicated, and secure has slowed down this activity. However, these problems have solutions and we can expect to see more on-line economics textbooks and courses. According to the survey, 23% of departments plan one or more Internet courses in two years compared to 8.9% providing at least one course today.
6. *Class home pages of other economics teachers:* Faculty members might benefit from ideas based on looking at the class homepages of other teachers. Particularly new teachers or those teaching new classes can look over a variety of syllabi on the web to see what others are teaching. Some class homepages also provide useful information and links for the students in the class—often on pages accessible by students from anywhere in the world. If a site is used this way, it is prudent to contact the instructor first, both as a matter of courtesy and to be sure the materials will be there

when assigned. These homepage sites are just a few of those available. (Note: in some cases, you will have to follow the links that indicate class or course pages):

“<http://william-king.www.drexel.edu/>”> Roger A. McCain

“<http://www.mtsu.edu/~rlhannah/homepage.html>”>Richard Hannah

“<http://www.colorado.edu/cewww/econ2020/>”>Jay Kaplan

“<http://www.cba.uiuc.edu/college/econ/>”>Jane Leuthold

“<http://mmcbride.sba.muohio.edu/>”>Mark McBride

“<http://wuecon.wustl.edu/~bob/>”>Bob Parks

“<http://ecedweb.unomaha.edu/>”>Click on name “Kim Sosin”

“http://medusa.be.udel.edu/WWW_Sites/oo_Micro.html”> J. Daniels.

Educational Uses Requiring Some Web Knowledge and Server Access

1. *Provide a class home page:* Some teachers have found it very useful to provide a class homepage for each course taught. A description of how and why to do that can be found in Leuthold (forthcoming 1997). The class page sites listed above include many of the characteristics described in this section.

Here are a few of the uses of a class homepage:

- (a) Add class materials to supplement or even replace a textbook, linked to additional sources of information, perhaps with pictures, maps, audio, video and bibliographic information. The teacher can also post assignments, sample tests, put a text block on the page for input or questions from student;
 - (b) Set up practice tests, self-tutorials, and actual tests that can be automatically machine scored and recorded (but be sure you understand security issues before setting up actual tests);
 - (c) Provide, on the web, Powerpoint slides or multimedia presentations used in or based on lectures. This can be a solution to a problem with multimedia presentations in economics, that students find it difficult to take adequate notes from the presentation;
 - (d) Coordinate large sections or multiple sections by providing one source of information;
 - (e) Include a link to your e-mail for questions, or include a text box so the question can be typed right into the web page. Links to other experts could also be provided, with their permission.
2. *Set up a discussion or “chat” group:* A web page can include a chat gateway, roundtable software, or MOO access to create multi-person discussions. The students can engage in chat groups, or economics experts or members of the community can be brought in as guests to discuss issues with students.
 3. *Publish students’ papers and reports:* Students’ written reports can both be based partly on web information and be published on the web to share with the class or the world. For advanced classes and seminars students can post papers for the other class members.
 4. *Teach an asynchronous web-only course:* A few full Internet/web asynchronous courses are being offered, and according to the survey more are under development. These are designed to provide the full course *via* distance learning with no class attendance or lecture components. An advantage of web-only courses over broadcast distance learning classes is that the student has full control over the time of day he or she accesses the material.

Glitz or Sound Pedagogy?

Although evaluative data on pedagogical advantages and disadvantages of using the web to teach economics and other subjects are not generally available, anecdotal information and reasoned

conclusions from experts abound. The advantages and disadvantages claimed for web-enhanced teaching are described in this section.

Potential Advantages Claimed for Web-enhanced teaching

1. *Access to current information:* Access to huge quantities of current information is widely viewed as the major advantage of the using information technology and is also the comparative advantage of the web. Most web sites that provide economic data are updated much more frequently than the printed materials. A web course can be updated each time the course is offered—or even while the course is in progress—in contrast to a textbook. The availability of huge quantities of data, some of which is updated more frequently than daily, is an advantage of educational web use that may be unique to the economics discipline. Also on-line journals and working papers are convenient and, for schools with small libraries, very important sources of information.
2. *Diversity of learning styles:* Several authors have argued that using technology increases the learning alternatives in that students of diverse styles of learning can be accommodated by the multiplicity of ways things can be presented via technology (Sell 1996, Niemi and Gooler 1987, Massy and Zemsky 1995). This observation increasingly applies to the web, as graphics, audio, and video combine with text to present ideas in a myriad of ways. The use of the web for self-paced learning and self-testing at students' choice of time also supports this point.
3. *Increased motivation to learn:* Information presentation is dynamic rather than being codified in print and if done right, is imaginative and designed to be visually appealing as well as informative. Self-paced materials, practice exams, simulations, etc. create "active learning."
4. *Reduced barriers of time and space:* The web makes asynchronous teaching and learning possible. The faculty member and student can be separated by both time and space for the web portion of a course. This is probably most attractive to the working adult learner, disabled students, and perhaps shy students who prefer to learn at a distance or to participate in chat or MOO groups.
5. *Low marginal costs of additional students or additional course sections:* For some technologies, the marginal costs of another student or even of another "class" could be quite low. The initial fixed costs are likely to be quite high for providing a new course that heavily Internet/web. However, the marginal costs for the web involve updating materials and by themselves are usually not high. The number of students who can use the material effectively is very large. (However, for contrary views see point (7) in disadvantages section).
6. *Improved student performance:* In addition to self-paced learning and self-testing on the web, students can present their papers to each other or to the world on the web. For example, Levin and Thurston (1996) report that the research shows positive "audience effects" of publishing on the web for others besides the teacher; in other words, students make a greater effort to produce finished polished papers if the paper will be web-published. The overall evidence on technology-enhanced learning outcomes (including multimedia, Internet, web, conferencing) from other disciplines is mixed (Conrad 1997), with some studies showing no significant difference and others showing significant enhancement of learning. The K-12 evidence is also mixed between "improved learning" and "no significant difference," though many studies do conclude that learning is improved (McRel 1997). It is important to note that studies do not show a decrease in learning. Specific economics studies of using the Internet in classes show enhanced learning, which the authors attribute primarily to increased instructor-student communications (Agrawal and Day 1997, Leudholt 1997, Manning 1996). Leudholt (forthcoming 1997) reports that 65% of the students in introductory economics agreed or strongly agreed that being able to utilize the web helped them understand the concepts, 86% felt the web increased or somewhat increased their

learning and 66% reported increased motivation. In her classes, attendance was as high or higher than in a traditional class. Finally, 94% said their familiarity with computers increased.

7. *Ease of record keeping:* Use of computer aided instruction, including the web if this feature is built into web pages, creates the ability to feed student results directly to databases, monitor progress on an individual basis, and measure student results on a continual basis. Incorporating this feature will increase development costs, however.
8. *May increase student-faculty and student-student communication:* Some of the advantages of e-mail teaching discussed by Manning (1996) would also seem to apply to web-enhanced teaching. She found that computer-mediated communication between teacher and students increases rather than decreases traditional communications. Such barriers to traditional communication as shyness, peer pressures, discomfort with teacher's or classmates' non-verbal cues, and time and space barriers are eliminated when distance learning methods are used. Just as students can ask questions via e-mail when the questions occur to them, they can review web material or take self-paced practice tests when they are ready to do so. An e-mail tag to the teacher from the web pages makes it simple and immediate for students to ask questions as they work through the materials. Also online chat groups for classes can be easily constructed in the class web pages. Compared to email, chat pages have the advantage of creating immediate interaction of students but the disadvantage of requiring simultaneous attendance. Thus communication tags from the web page to the teacher may make the teacher more approachable (though e-mail exchanges might be more formal and appear less friendly than face-to-face discussion).
9. *Tool for coordination and sharing among classes or universities:* Coordination of several sections of a class, or of very large sections, would be facilitated by using a web to post information and class notes for all. It might even save a few trees, if the students would read them on the web rather than printing them out. But this tool goes far beyond sharing among a faculty member's sections or even department's sections. Universities can share web materials world-wide, e.g., faculty members geographically separated can develop a course with each specializing and then share teaching materials for students on the web.
10. *Student Employment:* Anecdotal evidence suggests that students who can combine computer skills with economic analysis have an advantage in the job market, at least in the initial job search. Word processing, spreadsheets, and statistical programs are most important, but this also includes ability to use the web for locating information and resources. It is also easier to find internships for students who have these skills.
11. *Students will expect web-enhanced teaching:* In the future, students will be accustomed to and expect web, Internet, and computer mediated/assisted lessons as components of their learning when they get to college. Sell (1996) quotes an unpublished paper by Baker (1994), who observes, the "digital revolution is only partly technological; it is mostly cultural." If computers and the web are the way society deals with information in the future, it is certainly the way students will expect to find and learn information in school. After they experience computer-based learning in their K-12 education, will colleges seem out of date, both technologically and culturally, if they do otherwise?

Potential Disadvantages Claimed for Web-enhanced teaching.

1. *Providing information is not equivalent to providing education:* As Sell (1996) points out in an excellent on-line paper, it is important that we not confuse information or access to information with education or ability to use information correctly. The hidden assumptions in this confusion are that information and knowledge are synonymous and providing access is providing education. An additional potential confusion is that more information always implies that more education is

acquired. But none of these assumptions is true. Rather, we might say that information is necessary but not sufficient for education; students must comprehend and interact with the information in purposeful ways that change the way they think about some part of the world. In addition, the relationship between the amount of information input and the learning output is not linear. Diminishing returns and even negative returns set in when the amount of information begins to overwhelm the student's ability to see the overall picture, the patterns and relevance of the information. Web browsing can quickly reach a point of information saturation if web lessons and projects are not carefully planned and guided with the learning objectives in mind.

2. *Lack of quality control of web material:* Perhaps the most important thing to remember about using the web in education is that the materials on the web are seldom peer reviewed and many represent special viewpoints of the authors. The disadvantage is that students are likely to reach some web sites that misinform or mislead them. This has two associated implications: (a) the teacher will have to spend time essentially peer-reviewing any web material assigned in class (but teachers review *any* material assigned whether peer reviewed or not), and (b) since the teacher loses some control over what students discover and read, students must be taught how to independently evaluate information and information providers. Who is offering the information? What are his or her qualifications? Is this information consistent with what (other) experts say? Does this web page reflect a particular point of view? If so, what are other viewpoints? What can I learn from this information and on which points must I reserve judgment? To give an economics example, an economist who is sanguine about the government deficit is not likely to create a web page saying so; however, someone extremely concerned is more likely to provide that point of view on the web. It will often be necessary for the student to go to sources beyond the web to get a balanced view of an issue. Therefore, students should also be taught that the web is just one additional source of information in a whole portfolio of sources they must learn to use and evaluate. If we are in an information society which will require lifelong learning of its citizens, teachers have a obligation to teach students how to find and evaluate information, to learn on their own.
3. *Must retain expensive faculty or will compromise quality:* Although some faculty worry that technology will encourage a substitution of capital for labor in teaching, most experts who study the pedagogy issue argue that substantial faculty involvement will remain necessary if quality is to be maintained (Sell 1996; Massey and Zemsky 1995). In the words of Talbott (1995: 171) "The respect and reverence with which a subject is treated, the human gestures with which it is conveyed, the inner significance the material carries for the teacher—these are infinitely more important to the child than any bare informational content. . . . To lose sight of the child's healthy dependence upon the teacher is to forget that all knowledge is knowledge of the human being." Obviously he is speaking of younger students, but the point can also be made for adult-learners. If society attempts to reduce educational costs by web-enhanced teaching without the expensive faculty component, the loss of educational benefits could be substantial.
4. *Psychological and social problems can result:* Students can become addicted to the Internet to the detriment of all of their other activities. A list of related disadvantages of using Internet, computers, and distance education is provided by Eddy and Spaulding (1996). They list problems such as Internet addictions and psychological stress (from too many e-mail messages), loss of personal contact with people, and misuse of the Internet. They also note problems of hostility, shyness, or disrespect these highly computer-oriented students experience if face-to-face contact is attempted by the teacher. Student learning might be very passive unless active learning—involvement and feedback—is carefully built into the materials (Niemi and Gooler 1987).
5. *Reward system for faculty:* Several authors point out that Internet/web-enhanced teaching is still not considered for tenure or teaching assessments of faculty (e.g., Eddy and Spaulding 1996). Since startup costs are very large in terms of faculty training and instructional development time,

the lack of “credit” for this activity is a major deterrent to its development. Creating the web pages and responding on-line to students is time consuming (for some details on the time, see Leuthold, forthcoming 1997). Those who are currently active in web-enhanced teaching have a high enough interest level to make the required sacrifices. Although evaluations must ultimately be based on learning outcomes, if teaching is to improve some credit must be given to teachers who take a risk to try new pedagogical approaches.

6. *Web-enhanced teaching has opportunity costs of educational coverage:* Using the web also takes class time and students’ time. Faculty will have to be very creative to include web activities while maintaining the coverage of educational material in a course, or be sure that the educational benefits of using the web are larger than the losses of the material not covered as a consequence.
7. *Fixed costs are substantial, marginal costs may be high also:* Use of the web for teaching beyond the classroom creates high initial instructional development costs and requires a large initial hardware investment, either by the school or the students, for equitable access. If the schools provide hardware and software, which is currently happening according to the survey, the costs to schools will be substantial. These costs are often discussed as though they are one-time expenditures, but the marginal costs of maintaining and upgrading computers and software are substantial. If the students must provide the compatible hardware and software, there will not be equity of access. When combined with the need for continued faculty support of a web class, faculty input to maintain quality, and materials updating, the vision expressed by some legislators and administrators that on-line learning will be quite cost-saving does not appear to be realistic.
8. *Technology occasionally fails:* From the teacher’s point of view, the occasional failure of equipment adds an additional risk to use of technology. The practical consequence is that additional time should be taken to have a backup method prepared to teach the class, or to help students overcome technology problems.

Comments from Teachers with Web Experience

I asked *via* e-mail four faculty members who use the web extensively in economic classes to comment on the pedagogical advantages and disadvantages and students’ evaluation of web and Internet teaching. Two, Jay Kaplan of the Department of Economics, University of Colorado and Roger McCain, Professor of Economics at Drexel University, provided interesting observations about their experiences which they kindly permit me to share. Both teach classes that combine the web with traditional classroom and textbook approaches and Kaplan is teaching a Web-only class starting in the Fall of 1996. Their experiences appear to be quite different.

Kaplan reports that the majority of his students rely on the web and do not buy a textbook. The comments from students about the web materials have been very favorable, test grades have gone up (possibly because the students focus on the main ideas as outlined on the web and discussed in class). When he offers the class at a less desirable time, the class attendance drops but not the enrollment. Kaplan regards use of the web very favorably and finds that it is effective.

McCain feels that it is too soon to know the pedagogical advantages and disadvantages of using the web. The uneven coverage that results from differential abilities and inclinations of students to use computers is a disadvantage, although all students at Drexel are trained as freshmen to use e-mail and dorms are fully connected. About one-third of the non-engineering and computer science students do not use the web material. McCain’s earlier work supports the idea that interactive computer support can assist learning but he is still in the process of building interactive material beyond the prototypes. He adds that students print out the web material and his feedback from them on its usefulness varies widely. The e-mail component has not been successful for him in the sense of generating meaningful student discussions.

Conclusion: Where Should We Go from Here?

Based on the survey of economics departments, many now have in place the technology required to provide web-enhanced teaching. In these departments, the faculty have adequate computers in their offices, classrooms are wired for networked teaching, technical help is available, and students have access through computer labs. Yet over half of departments are missing one or more, in some cases all, of these critical components and are not ready to participate in this technology in teaching. A fundamental requirement for successful use of on-line teaching is that these resources be in place.

Are there pedagogical and cost advantages to webenhanced teaching? The list of advantages and disadvantages provided in this paper provide some guideposts of the important issues. A few salient points can be summarized (keeping in mind how quickly this technology changes).

1. *Economics on-line information:* Economics has an advantage compared to most disciplines in web teaching because the wealth of economics on-line information is particularly rich. But information is not education, so faculty must prepare web assignments carefully with course goals and objectives in mind to make them an integrated part of the learning experience
2. *Pedagogy:* In the words of Sell (1996) and Gooler (1987), what is critical is the need to adapt technology to learners rather than to adapt learners to technology. Teachers should work to engage students in evaluating and using web information to learn economic principles.. Students learn best when they are actively involved in the material and make it part of their “world-view.” Web sites that are a part of assignments should be reviewed in advance and students must be taught how to evaluate all information, including printed materials, CD-ROM, video, and web pages. Teaching web sites should develop interactive communication methods whenever possible.
3. *Costs:* It is not currently realistic to expect web-enhanced teaching to be cost-saving or time-saving, particularly in the development phase but perhaps also on a marginal cost basis. Development of on-line course material requires that faculty be provided with time, resources, and technical assistance.
4. *Faculty:* On-line course design, development, and teaching must be considered in the faculty evaluation process if it is to expand beyond those who are doing it because of a special interest in exploring new technology. Although the ultimate evaluation of teaching methods must be based on the extent to which students develop an interest in and learn the material, it is appropriate to give some consideration to faculty who are willing to pioneer risky teaching methods. Otherwise faculty will be inclined to use “safe” teaching methods, such as lecturing and writing on the blackboard; we will not know if other methods improve student performance.
5. *Computers and Employment:* Anecdotal evidence suggests that economics students who also have well-developed computer skills find employment, at least the initial job, more readily.

What do we not yet know? Serious studies must be undertaken to assess which materials and ideas are most suited to on-line teaching—studies including both marketing and pedagogical issues. Some critical questions to be answered by pedagogical research include

1. *Which materials lend themselves to web use and which do not?* Can only data be effectively incorporated or can theories and syntheses of ideas also be effectively web-presented? What are the benefits and costs of making web sites interactive, creating active learning for students?
2. *Can all students benefit from web-enhanced teaching?* It is said that web-teaching provides additional diversity to meet learning styles of students. But we don’t know which students can best learn on the web. How can we assess the web/Internet contribution to the learning of students?

And can we extend results of evaluations of classes with teachers who are enthused about using the technology to classes with teachers in general?

3. *How can we assure quality of information?* Is this a function only of individual teachers and students as is done currently, or should we be thinking about a more extensive peer-review system as we do for printed materials?
4. *What are the opportunity costs?* Given the financial condition of most educational institutions, how can the costs, both equipment and development time, be met? Will other faculty activities be cut back and what are their opportunity costs?

Careful and thorough answers to these questions will require a critical mass of studies of actual course experiences and experiments. Individual researchers cited in this paper and others are starting this research. The early returns find positive benefits to web-enhanced teaching.

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APPENDIX I

Survey Questions and Percent Distribution of Responses for each Question.

Technology for Teaching Economics
 "Department" in the following questions refers to the Department of Economics at your institution.

Please use the column grids labeled **A, B, C** to the left for these three responses:

A. Are you Dept. Chair? 0=no, 1=yes. If not, give title
 0=26% 1=74%

B. Is your Dept. in a Business College/Division? 0=no, 1=yes.
 0=49% 1=51%

C. Is your Dept. combined with another discipline? 0=no, 1=yes. If so, which?
 0=56%, 1=44%

*Additional comments can be placed on the back.
 THANK YOU for completing this survey!*

LEAVE BLANK IF YOU CAN'T EVEN ESTIMATE.
 UNLESS A SCALE IS PROVIDED WITH THE
 QUESTION, PLEASE USE THIS % SCALE:

CHOOSE ONE RESPONSE. PLEASE USE A PENCIL: Number of Departments = 324	(1) None	(2) 1-25%	(3) 26-50%	(4) 51-75%	(5) 76-99%	(6) All
1. In your opinion, what percent of faculty members in the Department have adequate computer equipment in their offices for preparing and delivering teaching materials?	4.0%	4.6	4.9	9.9	18.2	57.1
2. What percent of faculty members in the Department have a Pentium PC, PowerPC, MAC, Sun SPARC or comparable high end desktop computer?	15.4%	18.5	14.8	13.6	18.5	19.1
3. In your opinion, what percent of faculty members have adequate access to software in their offices (includes via a LAN) for preparing and delivering teaching materials?	9.0%	7.1	9.0	10.7	17.3	45.7
4. What is the primary source of funding for Department computers? (1=Dept funds, 2=Dept Grants, 3=Other University Funds, 4=Other (please specify) _____.)	23.5%	5.2	63.3	5.0		
5. What percent of your classrooms are adequately set up for teaching with: Installed Computer equipment, overhead panels/projectors?	15.1%	59.0	9.9	5.2	3.4	5.6
6. What percent of your classrooms are adequately set up for teaching with: LAN and/or Internet connections?	23.8%	54.9	6.2	2.8	3.1	7.1
7. Does the Department have adequate technical help for installing and maintaining equipment? (1=no, 2=yes from the dept, 3=yes from Univ, 4=yes, other _____)	26.5%	16.7	50.0	4.6		
8. What percent of faculty in the Department use for preparing class material? Presentation software (Powerpoint, Harvard Graphics, etc.)	24.4%	49.4	16.0	6.8	0.9	0.6
9. What percent of faculty in the Department use the following in their teaching? Multimedia software (Authorware, Director, etc.)	57.7%	34.3	3.7	0.9	0.3	0.0
10. What percent of faculty in the Department use the following in their teaching? Distance Learning- satellite links or video conferencing	71.6%	23.5	4.0	0.3	0.0	0.3
11. What percent of faculty in the Department use the following in their teaching? Listserv or Usenet with students in a class.	54.3%	32.4	7.4	2.2	1.5	0.0
12. What percent of faculty in the Department use the following in their teaching? Web-based assignments or class homepages	27.9%	50.5	13.8	3.1	2.5	1.2
13. Does your Department or University provide computer training for faculty? (1=none, 2=some but not adequate, 3=adequate, 4=more than adequate)	9.3%	38.9	44.4	7.7		
14. Does your Department have a Department of Economics web page? (1=no, 2=yes, 3=no, but is under construction)	30.6%	49.1	18.5			
15. How many courses does your dept offer primarily through satellite link/downlink or video conferencing? (1=none, 2=1 or 2, 3=3 or 4, 4=5 or 6, 5=over 6)	86.4%	10.5	1.5	0.3	0.6	
16. How many courses does your dept offer primarily through Internet (E-mail, Web, MOO/MUD, etc)? (1=none, 2=1 or 2, 3=3 or 4, 4=5 or 6, 5=over 6)	91.7%	6.8	0.6	0.0	0.0	
17. Within the next two years, how many courses are planned primarily through satellite uplink/downlink or video conferencing? (1=none, 2=1 or 2, 3=3 or 4, 4=5 or 6, 5=over 6)	77.2%	14.5	5.2	0.6	0.9	
18. Within the next two years, how many courses are planned primarily through Internet (E-mail, Web, MOO/MUD, etc)? (1=none, 2=1 or 2, 3=3 or 4, 4=5 or 6, 5=over 6)	76.9%	15.7	3.4	0.3	0.6	
19. What percent of your students have adequate access to computers? (Adequate"= computers to do what faculty want to assign not necessarily to do current assignments.)	1.2%	8.6	7.4	13.9	30.9	36.4
20. If some or most of your students have adequate access to computers, how is this primarily provided? (1=Computer Labs, 2=Students must provide, 3=Other _____)	87.3%	4.9	4.3			

Endnotes

¹ Keynote speech in Omaha on October 25, 1996. Reported in the *Omaha World Herald* by Doug Thomas on October 26, 1996, p. 61, "Speaker Touts Reach of Web."

² Two year institutions are also upgrading their use of technology. Although one two-year institution was inadvertently included, the study focuses on those offering bachelor's through Ph.D. degrees.

³ In the questions that refer to "adequate," this term was not specifically defined but left to the department chair to decide. Although chairs may have somewhat different notions about what is adequate depending on their own backgrounds, it seems likely that their views of what is professionally adequate for the job will be quite similar.

⁴ The absence of networked classrooms does not make web teaching in class impossible. A classroom might have a telephone line which makes access possible or the faculty member might place a whole web site on a local drive to show the class. Neither solution would be successful enough to use frequently.

⁵ MUDs are Multi-User Dungeons, which were developed for multi-person game and role play over the Internet. MOO (Multi-user Object Oriented, though other descriptions are also used) are similar but used for educational interactions and group discussions whereby group members can show each other Internet/Web items or provide graphics in addition to chatting. An example of the latter is **Diversity University (DU)**, a MOO "campus" reached via telnet <moo.du.org:8888> through the Internet. To "go" there, you can use a freeware Windows program called MUTT available from <<http://www.graphcomp.com/mutt/>> or you can go to **DU's** Web Home Page at <<http://www.du.org>>.

⁶ Details on definitions of categories can be found in the Carnegie Foundation for the Advancement of Teaching (1987). All of the schools in the study offer a range of baccalaureate programs. Research schools (Carnegie categories Research I and II) give high priority to research, receive annually over \$12.5 million in federal research support, and award at least fifty Ph.D. degrees each year. Doctoral schools (categories Doctoral I and II) have a commitment to graduate education through the doctorate degree and award a stated minimum of Ph.D. degrees annually. Our "Masters" schools refer to the Carnegie categories "Comprehensive I and II," which offer graduate education primarily through the Masters degree, award baccalaureate degrees in two or more professional disciplines, and enroll at least 1,500 students. "Bachelors" in our data refers to the Carnegie classifications "Liberal Arts Colleges I and II," which are primarily undergraduate colleges and typically have over half of their degrees in arts and science fields. Nine schools not in these categories but with economics department responded to the survey. They are most similar to the "Bachelors" category both in overall size and in survey results, so were combined with that category for these tables.

⁷ Some newer sites, such as <<http://pointcast.com/>> even permit the browser to act as a "screen saver" that continually updates with the latest news in the selected categories. This is similar to (and has the same productivity implications as) watching a news or financial channel on TV all day except that interest categories can be defined.