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Abstract

Although the majority of web based educational tools of today are unremarkable, are sometimes difficult to access and are not completely reliable, there is a mounting push for students and faculty to use these tools. The formidable technical challenges that confront students and faculty attempting to implement these technologies often quickly overshadows the more fundamental question—how should existing and future technologies be used in the teaching and learning process? Assuming, for example, that a given piece of technology could be implemented universally without difficulty and perform exactly as expected, what is the impact? Having made fair and unbiased evaluations concerning a given technology, important questions regarding implementation remain. For those that have resigned themselves to providing course material via the web, a common question for both educational institutions as well as individual faculty is if now is the best time to begin. One workable, logical progression path involves using a four-step process. The foundation of this process begins with experimentation, moves to deployment from templates, then to redeveloping pages based on need and student feedback, and finally to using this experience in innovation specifically tailored to the class needs.

Introduction

For many educators, the prospect of integrating technologies such as the World Wide Web into the educational process is likely reminiscent of their early experiences with classroom filmstrip projectors: setup was often awkward and difficult, there were always elusive technical problems with audio or video, content was sometimes less than remarkable, and students' attentions were typically less than undivided. In a like manner, the often-heard criticisms of yesterday's filmstrip could well be made against today's most frequently seen educational Web implementations. Yet, the broad and evolving success of the Web in education shows no signs of slowing. Although haunting images of melting celluloid and exploding projector bulbs no doubt remain, the siren song of the Web continues to grow louder from every direction. The push to create Web-based educational tools from university administrators, technologically aware students, the mass media, and competing institutions has become one that can no longer be set aside.

When Web technologies were first beginning to emerge, speculation abounded over the tremendous implications these held for distance education. As the veil was pulled away however, formable issues concerning real-world feasibility and actual student enrichment through this high technology begin to emerge. Roadblocks such as prohibitive cost, inadequate human resources, and a steep technical learning curve have been, and often continue to remain, barriers to serious educational Web development.

Preceding the more practical (or tactical) issues facing the development of Web technologies in education, there are more fundamental questions concerning if, when, and how these technologies *should* be used in distance education or in any formal teaching and learning model. Before choosing between moderated and open newsgroups for example, it may be necessary to ask what effect newsgroup technology itself has on the social aspects of the learning process. Asked another way: presuming all the technology works exactly as intended, is the learning process being enhanced as a result of the technology use in ways that are meaningful and significant?

Examining the practical roadblocks commonly faced in educational technology integration in the light of fundamental philosophical issues provides a methodology for determining appropriate educational applications of the World Wide Web in today's teaching and learning environment. We are then drawn to ask: Do electronic discussion forums provide students with an enhanced level of communication that contributes significantly to the learning experience? Are moderated or open discussions better suited for classroom discussion? Is creating a class Web page useful or even appropriate when it is known that not all students will have a reasonable level of access? How will students with disabilities, such as visual impairments, access the electronic resources made available to other students?

Is Now the Appropriate Time to Begin Focusing on Web Development?

The growing tide of technological development in education has left little doubt as to whether institutions as a whole (and hence the instructors teaching for them) can avoid integration of the Internet into their curriculum. Yet presently the total ratio of classes on the Web is small when compared to the total number of classes offered, suggesting that while some institutions have rapidly embraced Web development, many others have delayed resource commitment. A wide array of reasons, sometimes compelling, are advanced as a rationale for delaying the investment in or development of Web pages and their related technologies:

- Developing resources on the Web may be an important task, however there are other compelling demands for an instructor's time. Realistically, even an extraordinary amount of effort expended on Web development may not bear fruit for some time.

- Past advances in technology have resulted in improved Web development tools that do in only a few hours what would have taken weeks or months just a short time ago. As technology is constantly moving ahead, similar future advances in the tools of tomorrow will again likely reduce the amount of time it takes to create pages and similarly increase the quality of the work product created.

- No central Web publishing site is available. Without a central publishing site, faculty find it nearly impossible to publish a Web page because of the problems inherent to hosting a Web server.

- Neither appropriate funding nor trained support staff are presently available to assist with new web development technologies. Delaying development may allow a funding window to become available and permit training for support staff.

- Those who wait to develop their sites will be able to build upon the successes and learn from the mistakes of early-adopters investing large amounts of time and other resources in today's Web development.

- Students do not yet have Internet access. This creates an unfair advantage for those who do presently have access as well as unfairly excluding those who do not.

While the above listed reasons could be cited in a wide variety of circumstances, there are good reasons for individual faculty and for the institution as a whole to look past them and move forward with Web development. Administrative perceptions regarding early development of Web pages for education must be realistic and carefully managed for a successful initial implementation. Rewarding early technology adopters, remaining open to alternate directions in the face of short term successes or failures, discontinuing fast-failures of dead-end technology, and providing funding for low-cost trial runs are examples of administrative support that can save an initial Web development effort. Faculty participation in this initial stage of development is crucial; administrators that fail to involve faculty at the beginning will have difficulty procuring enthusiastic support later when buy-in is essential. Even where there are seemingly compelling reasons to delay Web development, there are advantages to moving forward even if on a reduced scale. Some important reasons for moving ahead with development include:

- The Web can be an exciting and challenging area for both students and instructors. Any creative work takes time, and many instructors find great personal and professional reward from the time they invest in Web and related technological development.

- The fact that technology continues to advance and that today's Web-publishing procedures seem tedious and perhaps even arcane serves to suggest that eventual replacement is likely. Technology will *always* be advancing, however delaying development may only result in having to deal with a similar set of problems later.

- Until very recently, an absolute prerequisite of Web page development was the setup of a large, centralized institutional Web server where faculty could publish their pages. Without access to a centralized Web server, a faculty member had no way to publish Web pages or otherwise share them with students. While the centralized Web server remains the generally *preferred* method of publishing instructional Web pages, it is now feasible to host a Web page without access to such resources. Today, the faculty member's personal computer is generally sufficient, provided it connects to the Internet and has reasonable computing power.

- If there is very little money available at an institution-wide level today, there is an even smaller likelihood that sidestepping technologies such as the Web will later result in greater availability of funds. Technologies have evolved to the point that the large investments once needed to get started with Web page hosting and development are no longer necessary. Building a small site using only an existing personal computer connected to the Internet requires an investment as small as fifty dollars. Such low-cost solutions include PC Web server software and page editing tools for Web creation, publishing, and ongoing site maintenance.

- No matter when a person decides to learn about technology, there will be a learning curve and mistakes are probable before polished results come together. Waiting for another person to make all the mistakes only delays valuable learning experiences that will have to be faced in one form or another at some point. There are no substitutes for personal experience with technology.

- All students, including students with disabilities, must have adequate access for the technology to be feasible. Most institutions have on-site public computer labs,

which are available to enrolled students without additional cost. Students in distance education programs are generally required to have access to a computer for electronic access prior to enrollment.

- Today's students do not have the luxury of waiting months or years for Web technologies to become more convenient for their schools, their instructors, or for themselves. Learning to use today's available technology is as much a part of the learning process as the subject matter the underlying pages are intended to promote. Even when considering the rapid rate of change, learning about the technologies currently available can only help prepare the student and the instructor for the technologies yet to come. Software developers know that their products can be complex, and attempt to build upon previous releases so that the client's knowledge of the previous version may be directly applied.

It would be impossible to consider all of the reasons why universities and faculty members either start or delay Web development. After carefully considering the factors unique to each situation, decisions about how to use these technologies in course development must ultimately rest with the individual course instructor. It will be the faculty member who will be primarily responsible for the creation, focus, content, design, and upkeep of the class Web page. Once the decision to move forward with a Web page is made, an appropriate starting point for development must be identified.

Logical Progression Paths for Educational Web Development

A typically recurring theme for initial Web page development is that instructors should start very small with a basic design that may be quickly completed. Small group or individualized instruction with good follow-up and quick, demonstrable results are crucial during this initial stage. For example, many course page design workshops being done for faculty emphasize initial page design, creation and publication during a one or two hour session. A second course, offered perhaps a few days later, then builds upon the first session by providing additional instruction to create easily enhanced functionality.

During and after the initial training, instructors need to have continued access to the same level of software and hardware initially used during training. Ongoing support should include access to personal computers that are properly connected and configured with a standard set of utilities supported by the institution. A non-public practice environment, and ongoing access to technical support staff who are able to resolve technical issues that will inevitably arise, are also crucial. Once instructors begin to develop web building skills using the training that they have received, defining a longer-term logical progression path will help faculty move toward independent development.

Planned phases of Web development extrapolated from naturally progressive steps of learning are familiar to the instructor's environment and will provide the most comfortable, creative, and productive development atmosphere. For example, rather than extending the process of initial development through an entire semester to develop a comprehensive set of Web pages, developing an initial brief page in the month before the target class begins may be more beneficial. A small low-cost initial page provides the instructor with an initial test-bed to accept peer and student feedback, while keeping the initial focus on a page that can be easily changed as well as fundamentally redesigned. While the actual phases of development are often heavily dependent on the instructor's individual environment and supported development tools, a useful model for logical progression might include the following steps:

Phase One: Experimentation

Phase Two: Template

Phase Three: Redevelopment

Phase Four: Innovation

These phases could be set out formally set out as part of a structured training program, or informally as an on-line series of tutorials. Whether these phases implemented as part of a structured training program or as general guidelines, their function is essentially the same. Each of these phases brings the instructor closer to the goal of a Web page that serves needs of the students in the class in an informative, interesting, and professional manner.

Experimentation

In the initial stage of Web page development, experimentation is of primary importance. Page authors must feel free to investigate the tools they are using without fear of harming production data, their machines, the central server, or any other component in this environment. This phase of initial experimentation and discovery also should be offered in an private environment in order to prevent the anxiety that initially exists when Web pages are published for the world to see.

Experimentation is also very important because today's advanced, feature-rich Web development tools require a considerable amount of open investigation before the power of their functions becomes readily apparent and can be used with skill. Once instructors have become confident with the technology, the next step, using templates in Web development, can begin.

Template Development

One of the apparent problems instructors have designing Web pages is getting started with an initial design from a blank screen. What is the theme of the page? How is information organized for easy navigation? What kind of information is displayed or collected? How do other instructors use the Web to teach their classes? Fortunately, using the course template as a starting point resolves each of these

issues. The course template usually involves a predefined skeleton or "shell" which the instructor can modify provided the content meets established university guidelines. Selection of specific starting templates may vary by department, course, or individual instructor.

Course templates often are designed in a degree of levels, starting with simple text and graphics and progressing in complexity through demonstrations of some of the more advanced functions of the server. The best approach may be to steer the beginning instructor toward a more basic template, later introducing the advanced functions of the server using a "toolkit" approach. Keeping the initial design focus on basic functions allows instructors to build a solid foundation without the concerning themselves with the complexities advanced server functions inherently bring.

Redevelopment

Instructors may move very quickly between redevelopment and innovation, especially if their initial experimentation and use of templates has given them a high comfort level. The process of redevelopment includes two major goals. First, instructors begin to look beyond the "cookbook" approach of the template to develop pages more reflective of their own teaching style and course development needs. Secondly, the instructor will generally attempt to recreate many of the course functions and concepts within the web page. For example, essential course concepts contained in outlines, lecture notes, and results of classroom discussions are likely to be reproduced in Web form. Important administrative functions such as practice quizzes, course calendars, and discussion areas are advanced examples that may require advanced design preparation and support, as they require user interactivity as opposed to displaying static information.

Finally, knowing about the opportunity for a "redevelopment" from the start allows the instructor to operate less critically in the initial phases of development. From this point of view, the redevelopment phase can be marketed to faculty as a time to reexamine what has been created up to this point and switch direction if appropriate.

Innovation

Innovation provides the gateway for unlimited high-end Web development and brings the development cycle full circle. Moving past templates and page redesign, innovation is concerned with development at the next level, often encompassing interactive pages that engage student input and interaction.

Before instructions advance into these areas however, it is important that they receive ongoing guidance in understanding the difference between *technological innovation*, and *educational innovation* however. While there is no bright line separating the two, looking at new technologies from a critical viewpoint will help eliminate poor technological choices that serve more to demonstrate technologi-

cal wizardry than contributing to the teaching and learning process. What may first appear to be "innovation" may forestall an otherwise successful development effort; embracing new technology too quickly or without proper planning leads to dead-ends that make recovery difficult. For example, a reasonably complete and well organized course page may quickly become bogged down by excessively large and cumbersome graphics, unnecessary use of movies or other high-bandwidth applications, and tools requiring students to download and configure advanced "plug-ins" before the page can be seen. The danger is that using the leading edge technology does not necessarily produce leading edge students; technologies should be selected based on an impartial evaluation of how they engage the learner opposed to other less complicated and universally compatible solutions. The development tools and resources that promise the most exciting web development opportunities cannot be applied successfully unless their use is part of a larger institutional plan which provides for their large-scale integration. For example, at the present time connecting Web pages to databases stored on mainframes or other large computing systems requires extensive setup of back-end facilities by dedicated computer professionals.

How can new technologies be effectively integrated while avoiding these pitfalls? One successful approach has been to develop a supported "toolkit" of higher-end supported tools which instructors may use to develop advanced page functions. The "toolkit" approach is an effective way of introducing new technologies which heading off rogue directions that can slow the development process. When instructors are ready to venture past templates towards innovative pages of their own design, providing them with a set of advanced tools which have been tested and are supported within the organization. For example, new graphics design packages that can be used to create three-dimensional images are becoming widely available and have advanced to the point that they are not prohibitively difficult to use. Developing a workable support strategy for all of the available packages however would be impossible. Even attempting to support the top ten packages would likely be a tremendous drain on institutional resources given the disparity between the various packages. In contrast however, selecting the best one or two packages and making them readily available to instructors as part of a supported toolkit provides a more workable solution. As instructors justifiably demand greater support for functionality, the toolkit can be expanded to include appropriate resources to fill those needs without overextending the support staff. Advanced workshops and introductory training for these supported packages then becomes more manageable. In order for a the "toolkit" approach to work effectively, institutional support staff must take an active role in supporting the products included in toolkit as well keeping the toolkit updated to reflect advances in technology and required additional functionality.

Conclusion

The World Wide Web has become and will likely remain an increasingly important medium for supplementing and even delivering course content. Although the Web we have today is the product of very recent technologies, many of the problems educators' face in effectively using the Web today parallel the problems experienced using the "new" technologies over ten years ago. Overcoming the many potential roadblocks that stand in the way of successful Web development requires educators to work in close cooperation with the administrators and technologists responsible for developing the underlying infrastructure that makes the Web possible. Notwithstanding the many reasons propounded for delaying development, now is the time to move forward even if on a small scale. Once the decision has been made to move forward planning deployment using the naturally progressive steps of experimentation, use of the template, redevelopment, and innovation will provide instructors with a comfortable and productive development environment. Using the "toolkit" approach for bringing new technologies into the development environment will help head off rogue directions while providing a manageable support path.

Call for Editors

Mid-Western Educational Researcher

Journal of the Mid-Western Educational Research Association

Proposals are currently being sought for the Editorship of the *Mid-Western Educational Researcher*. The *Researcher* is the quarterly publication of the Mid-Western Educational Research Association, with the summer issue of each year serving as the annual meeting program. The journal serves the dual function of providing MWERA members with timely information about the organization and of providing a vehicle for dissemination of scholarly work in education or education related fields. This dual mission reflects the growth and change of the organization itself in recent years.

The three-year appointment of the current editorial team will expire in October, 1999. The appointment of the next editor or editorial team will be from October, 1999, through October, 2002. However, it is anticipated that selection of the new editorial staff will be made in sufficient time to allow the new staff to work with the existing staff during much of the 1998-99 year. Proposals are sought from individuals and teams interested in assuming responsibility for the operation and direction of the *Researcher* for a three-year period. The format for proposals is open, but each proposal should include at least the following:

1) Name, institutional affiliation, address, telephone and FAX numbers, and e-mail address of each member of the proposed editorial team;

2) A vision statement indicating the editorial team's intended goals for the journal, and an explanation of how this vision reflects the membership, perspectives, and direction of MWERA;

3) A proposed plan for promoting this vision; and

4) An explanation of the expertise and qualifications of the editorial team which are likely to encourage the continued improvement and development of the *Researcher*.

Proposals should be submitted no later than October 1, 1998, to the President of MWERA, Dr. Kim Metcalf, at:

Dr. Kim Metcalf, Director
Indiana Center for Evaluation
Smith Research Center, Suite 174
2805 East 10th Street
Bloomington, Indiana 47408

Questions may be directed to Ms. Rebecca Gross, Administrative Assistant, at (812) 855-4438, FAX (812) 856-5890, or e-mail: iuice@indiana.edu.