

Viable Technologies and Strategies for Developing and Administering Distance Education Courses through Electronic Means in Small States

Kim I. Mallalieu

*The Department of Electrical and Computer Engineering,
University of the West Indies, St. Augustine, Trinidad.*

Abstract

This paper discusses the development and administration of distance education courses using current yet affordable data and telecommunications technologies which do not require dedicated capital expenditure. These technologies are well suited to small island states already equipped with distance education centres. Guidelines are offered for the manageable maintenance and updating of course materials. Proposals are made on methods for implementing strategies and technologies for the provision of a rich portfolio of student services which mimic the in-person teaching model yet benefit from the flexibility and availability of distance education courses. These methods may be used on their own for courses delivered entirely through electronic means, or may be used to supplement traditional distance teaching methodologies. The paper closes with a checklist of implementation and administrative challenges associated with the delivery of distance education courses through electronic means, and makes recommendations on how these may be avoided.

Introduction

Electronic technologies offer tremendous opportunities for effective teaching. They also offer additional advantages, for example opportunities for automation of assessment exercises and rapid deployment of course materials. Whereas the popularity of electronic technologies in distance education may be based on the latter, this paper recognizes that their essential value lies in their ability to enable high quality, rich learning. The paper does not promote electronic course delivery as a means to simplify the teaching process, reduce interaction with students or remove the responsibility for grading student submissions.

The electronic technologies of most concern in distance education are the means by which material is delivered to students, that is, "media". Classifications of media include audio-vision, broadcast video, portable video, dedicated video conferencing, computer-based and Internet-based technologies.

Empirically, it has been shown that the vast majority of distance learners fall into the category of working-age, literate adults employed in non-manual jobs (Woodley et al., 1987). For these learners, Internet-based technologies offer significantly more features than audio-vision, broadcast video, portable video and dedicated

video conferencing technologies. Off-line computer-based content delivery offers less functionality than Internet-based (more particularly “Web-based”) delivery, lacks the interactivity of video conferencing, but offers more features than audio-vision, broadcast video, portable video and, of course, unsupplemented printed materials. In addition to offering more functionality, Internet-based distance education need not require the purchase of dedicated hardware. For large-budget organizations a mix of technologies may be financially justifiable. For more modest budgets, Internet-based delivery offers the best balance of accessibility, features and cost.

This paper, then, presents an overview of what is required to develop and administer Web-delivered courseware. It distils this into recommendations for technologies and strategies that are particularly well suited for the Caribbean.

Development of Electronic Courseware for Distance Education

When course material is posted on a web site, it is important that the purpose of posting is clear. For example, is the material being posted

- To reduce the printing costs of the teaching institution?
- To ensure timely dissemination of incidental or urgent information?
- To enable the submission of student assignments for electronic grading?
- As an archive of course materials (as distinct from the delivery of course content)?
- As a means of delivering whole courses through distance education?

If material is being posted on a web site for the first four reasons, and this is clear in the minds of

instructors and made clear to students, then it is acceptable that its form mimic that of its printed counterpart. For the delivery of distance education courses, however, it is entirely unacceptable that reams of textual lecture notes be represented in electronic form. The Internet (the communications network on which the Web lies) has its remarkable strengths which, for effective delivery, must be well matched to the form in which content is posted (Mallalieu, 2000).

The Web offers a rich alternative environment to the physical classroom and, therefore, far more opportunities than printed material alone. It offers abundant possibilities for discursive, adaptive, interactive and reflective opportunities (Laurillard, 1993). The electronic community presented by the Internet enables the instant establishment and maintenance of learner communities in a manner not possible with other media. Opportunities exist for multimedia, interactivity, asynchronous and synchronous learning and communications, nonlinear navigation of resources, and many other forms of investigation and assessment (Palloff and Pratt, 1999).

Preparation of well-designed course materials for Web delivery is laborious. It is enormously rewarding, though, as it forces instructors to plan, organize, structure, articulate and present their course content in a manner that is accurate, efficient and effective. For this reason alone, if students are never exposed to the materials online, the exercise is worthwhile.

To administer a Web-based distance education course requires the functions of systems administrator and instructor. In some cases these roles may be accomplished by the same person, in others they may be separate. In any event, it requires the creation of course content, posting course materials on the Web, managing student-

student discourse, supporting students in their learning experience and learning from experience.

Current Technologies for Preparation of Electronic Courseware

Content delivered using real-time video broadcast, video conferencing, audio conferencing and audio-vision technologies is prone to instructor error, tangential excursions and ambiguities. These modes do not afford the same degree of off-line materials revision as does the Web. Though quality is assured more robustly in prerecorded video material and printed matter, the former requires very expensive facilities and technical expertise and the latter is poorly lacking in features and opportunities. The use of Web technologies does not necessarily require access to the Internet. Web technologies may be used to design course content for CD distribution. In this case, all features of Web-based instruction are available except for communications. Supplementary services may be offered over the Internet, including e-mail, asynchronous threaded discussions, audio and video conferencing. Alternatively, students may be required to participate in a few online activities, for example the submission of assignments or peer group collaboration.

Electronic course materials may be prepared using a range of popular applications, including Adobe GoLive, Microsoft FrontPage, Adobe PageMill, Allaire HomeSite, NetObjects Fusion, Bare Bones BBEdit, Asymmetrix ToolBook II Instructor, Asymmetrix IconAuthor, Macromedia Authorware, Allen Communications Quest, Microsoft Word and TextPad. These products range from sophisticated, specialist web design tools through familiar word processors to the most generic text editors.

For the advanced user, there are powerful tools available for the production of course components

involving multimedia, interactivity and animation. Macromedia carries a comprehensive line of such tools. For these developers, specialist products for graphics layout may be used in conjunction with basic text editors. Products include QuarkXPress, Adobe Illustrator, Adobe InDesign, Adobe ImageReady, Adobe PageMaker, Adobe ImageStyler, Adobe Photoshop and CorelDRAW.

Instructors or institutions may prefer to produce and post all of their content from within dedicated electronic course management applications. These include Topclass, WebCT, CourseInfo, VirtualU, Intralearn, Web Course in a Box, Librarian, Pathware, Learning Space, Learning Server and Symposium.

Viable Technologies for Electronic Courseware

Filtering through the plethora of technologies and applications available for the support of online course development, delivery and maintenance need not be a daunting task. For average instructors who must, or choose to, prepare content for Web delivery by themselves, the criteria for viability are essentially:

- Use of a limited set of familiar tools for multipurposes – the standard word processor is often sufficient
- Where possible, the use of open technologies – those that yield and manipulate files of standard formats, most particularly html
- The ability to edit the details and sequencing of content quickly

All standard word processors are capable of generating Web pages, a range of visual objects and animated effects. As instructors are familiar with these applications, and have already developed fluency with them, they are ideal for the preparation of course content for the Web.

In particular, course developers will not be burdened by having to learn how to use specialist software and correspondingly, attrition rates will be low. Additionally, these applications should be licensed by universities for general purpose use anyway, so no further expenditure is required. Another advantage is that word processors offer the What-You-See-Is-What-You-Get (WYSIWYG) feature, so are highly recommended for first time and tentative course developers.

Another compelling reason to use familiar word processors in the development of content for the Web is that it is in a standard format that may be reused for printing, archiving and re-purposing needs. The disadvantage of using word processors for Web content preparation is that the code they generate is typically verbose, not succinct and optimum. In cases in which web content is prepared by a specialist team then use of more advanced tools is suggested.

A tool that is viable and useful in the building of text-based electronic courseware is e-mail. Though the most obvious application of e-mail is for communications, it also represents a powerful channel for generation of frequently asked questions (FAQs) databases. Questions from students, sent via e-mail, and corresponding responses from instructors may be continuously concatenated to FAQs in online courses. Not only does this practice guide revisions in the manner in which course materials are articulated and presented, but it also provides a tremendous supplementary service to students.

Once electronic materials are prepared for Web delivery, they must be posted to a server. Web technologies will fail for the purpose of course delivery unless they allow the flexible, immediate and convenient editing of the minutest of detail in course content. Instructors must be able to change a word here, restructure a sentence there, relocate a huge body of text, at any time from their

desktop. Every revision to the course content must subsequently be posted. The use of course management systems which require tedious operations to effect minor edits may demotivate content developers and, worse, result in a compromise of content quality. Effective strategies include building a support community of course developers, the use of applications support staff and simply choosing course management applications which do not wrap content into proprietary packages.

The ability to edit details of audio and visual materials motivates good practice in the production of high quality courseware. The taping of long instruction sessions hampers the natural and beneficial growth and revision of course materials and presentation. This mode of content preparation for modest budgets fails in two key respects:

- 1 Scheduling of recording is not entirely under the control of the instructor: a production team and equipment must be arranged before recording can begin.
- 2 Editing is cumbersome, if not impossible, and certainly out of the hands of the instructor.

Visual and voice information may be prepared and revised on instructors' desktops if clips are short. A viable strategy for associating voice with video or static visual content is for instructors to prepare electronic viewgraphs, each with its short voice clip. In this mode, the voice files are invoked by students through selection of an appropriate icon on a Web page. The viewgraphs may be prepared in html using any standard tool as described previously. The voice can be recorded using a standard desktop computer microphone and generic sound recorder. The former costs roughly US\$10.00 (in the year 2000) and the latter comes standard with all sound cards and most operating systems. Conversion of sound files to MP3 format

is recommended as it offers industry standard high quality as well as dense compression formats.

The development strategy of viewgraphs associated with short sound clips is tremendously powerful. It affords the opportunity for instructors to record lectures incrementally as well as edit microscopically. The viewgraphs are trivial to edit using standard tools. The sound clips, say two to five minutes each, may be edited or completely overwritten. One sound clip may be associated with each viewgraph or any number of sound clips may be associated with a single viewgraph. Viewgraphs and sound clips may be re-ordered instantly by copying and pasting.

Checklist for Small Island States

1. Training the Trainers

Are instructors adequately trained to use electronic technologies? Electronic technologies for the delivery of courses motivate an entirely new pedagogy. As these technologies are relatively new, instructors and host institutions must undergo both cultural and technical training to best take advantage of the opportunities they afford.

Recommendation: Organize nonthreatening training opportunities for academic staff in:

- Instructional design for Web-based instruction
- Electronic technologies (desktop tools, Internet, course management applications, etc.)
- Community building

2. Support in the Early Days

Is there a community of users who can lend support? Support on the production and administering of online course materials must come from people who have themselves developed course materials for electronic media. This support cannot come from a network systems

administrator whose portfolio is to maintain electronic course management applications.

Early adopters represent a key resource in the migration to online course delivery. They are the ones who build value for the notion of online education. They are the ones who do it for the love of it. They must be encouraged. Their recommendations from actual hands-on experience and field trials are vital. When response to their recommendations is prompt, they are likely to grow their activities to tremendous proportions and become the most valuable in-house resource.

Recommendation: Support early adopters and explicitly include them in the project community. Encourage them to mushroom their expertise using support staff who can in turn offer consultancy services to the more cautious.

3. Familiarity

Are instructors familiar with the electronic tools? High rates of attrition will result if the everyday work of instructors does not involve using the electronic tools necessary to produce and administer their online courses. If instructors have to relearn electronic tools every time they need to edit, add or administer course materials, they will dishearten and dilute the efforts of the whole organization.

Recommendation: Encourage cautious adopters to use familiar electronic applications that they use for other purposes, for example word processing.

4. Confidence

Are instructors confident about the new technologies and pedagogy? The best way to build confidence in instructors new to the technologies and pedagogy of online course delivery is to encourage them to phase electronic components

into their course materials gradually. This incremental move from established materials and methods to their electronic counterparts (Mallalieu, 1999) affords instructors the opportunity to establish a suite of course utilities and experiences that is consistent with their teaching style and content.

Recommendation: Plan the phased introduction of electronic components into distance education courses. In the first phase the instructor may post all of the administrative details about the course and encourage e-mail support for queries. The second phase may involve the introduction of a bulletin board to support threaded discussions and perhaps online-graded self-tests, not for assessment. The third phase may involve the posting of core content, appropriately designed for electronic media. The final phase may be the introduction of automatically graded exercises for assessment. Of course these phases are followed by revision in every subsequent offering.

5. Contingency

Traditional classroom teaching depends on the airwaves for communication. Traditional distance teaching depends primarily on the postal service for communication. Online teaching depends on more advanced technologies which are not as well established. Whereas we assume that the lecture hall will always be illuminated because the well-established electricity generation and distribution services are reliable, data communications infrastructure is not so well established and therefore not as reliable.

Recommendations: A mix of media should be used: print, CD and Web-based.

6. Institutional Support

Institutional support is necessary to ensure that supporting services are robust and reliable.

Recommendations: Web servers that host course materials must be available for student access 24 hours per day, seven days per week during semester. This entails 24/7 maintenance and administration of

- The web server (the computer)
- The web server application
- The course management application, if used
- The data network
- The Internet access facility

The following are also required:

- Automatic back-up, on a separate storage unit, of all student data, most particularly assignment submissions
- Application support for course management system, if used
- Development support for the creation, revision and delivery of content on the Web

Around the clock phone-in and e-mail support from the administrators of these facilities is also highly recommended.

7. Student Support

The students themselves need to appreciate the value that electronic technologies bring to their learning experience. They will do this if the course content is accurate and articulate, materials are appropriately designed for online delivery and instructors are responsive to their needs.

Recommendations: Instructors should

- Be thorough about content – eliminate all mistakes and ambiguities
- Design course to be student-centred

- Afford opportunities for all learning styles (Claxton and Murrell, 1987)
- Post student evaluations
- Respond comprehensively to concerns and recommendations in student evaluations
- Respond to student e-mail promptly (within 24 hours) and graciously, regardless of content
- Advise students in advance if they will be unavailable for e-mail contact for a few days or more
- Apologize abundantly if unable to respond promptly to students' e-mail

8. Convenience of Access

Is access to course materials convenient? One of the tremendous strengths of online education is that it offers guided yet flexible, self-paced learning. When access is limited to formal learning centres, ad hoc scheduling may not be possible and commuting may not always be possible or convenient. True flexibility, then, is afforded when students are able to access course materials from home.

For those students who already have computers and Internet access in their homes, Web-based delivery is very convenient. For those who have computers but no Internet access (or costly Internet access subscription), course CDs are very convenient. When course content on CDs is implemented using Web technologies, students benefit from all of the strengths of online instruction except communications. For communications purposes and for the submission of online exercises, these students may travel to the closest distance education site.

Additionally, if recommendations previously made in this paper are followed, students may browse hard copies of lecture transparencies and other text and visual content in print, to reinforce online lecture sessions.

Recommendations: Course materials should be available in a mix of media: print, CD and Web-based.

Conclusions

Distance education represents an important means of increasing enrollment in higher education programmes and also of offering increased access to higher education for working adults. However, the flavour of the offering is intimately tied to the medium through which course materials are delivered and through which instructors and students interact. Non-electronic technologies are disadvantaged by the dissociation of participants from the instructor and from the peer community. Distance education courses taught using non-electronic communications means also suffer from cumbersome feedback mechanisms or worse, no feedback at all. Some electronic technologies, which address these shortcomings, are inflexible and require enormous capital expenditure. Additionally, these latter technologies are forever threatened by extinction.

This paper promotes the use of Web technologies in the delivery of distance education courses. These technologies may be powerfully combined with Internet access to support a rich set of communications facilities. Without Internet access, they still offer tremendous flexibility and convenience for learning at home. Recommendations have been made on strategies to address the key challenges of adopting electronic technologies in distance education.

Bibliography

Claxton, C. P. and Murrell, P. H. (1987). *Learning Styles - Implications for Improving Educational Practices*. ASHE-ERIC Higher Education Reports. Texas: Association for the Study of Higher Education.

Laurillard, D. (1993). *Rethinking University Teaching*. New York: Routledge.

Mallalieu, K. (1999). "Migration Towards the On-Line Delivery of Engineering Courses." *APEIT's 12th Annual Technical Conference: 2nd Latin-American and the Caribbean Forum on Engineering and Technology Education*.

Mallalieu, K. (2000). "Optimal Partitioning of Content and Evaluation, by Media, in the Electronic Delivery of Engineering Courseware." *Proceedings*

of the 16th International Conference on CAD/CAM, Robotics and Factories of the Future, to be printed.

Paloff, R. and Pratt, K. (1999). *Building Learning in Cyberspace: Effective Strategies for the Online Classroom*. San Francisco: Jossey-Bass.

Woodley, A. et al. (1987). *Choosing to Learn: Adults in Education*. Milton Keynes: Society for Research into Higher Education and Open University Press.