

USING NEW INFORMATION TECHNOLOGIES FOR FLEXIBLE LEARNING

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ABSTRACT

The author's experiences with two undergraduate teaching units illustrates the time-consuming and expensive nature of developing technology-based learning resources. While extra funding enabled the resources to be delivered on-line and on CD-ROM, accelerated development timelines resulted in minimal pre-testing and some delivery problems, all providing lessons for future developers.

INTRODUCTION

Electronic media, particularly the Internet, are increasingly assuming a greater importance to tertiary educators. Just as educators required generic skills such as writing to develop and deliver resource materials for classroom and conventional distance education use, technology-based educators need to be able to select and manage an appropriate mix of technologies to be effective. Some manipulation of the technology is required. More often, however, the skills required are more prosaic and include managing time, making effective use of individual and small group communication systems, and advance planning.

These skills are exactly what we often suggest as important for students to acquire as part of becoming lifelong learners. This paper examines one academic's experiences with developing and delivering flexible learning materials for multiple classroom and on-line delivery. Hopefully we can learn from the mistakes and profit from the positive experiences detailed.

Central Queensland University (CQU) is a 10,000 student multi-campus and distance learning institution with its main campus at Rockhampton. Approximately half of its students are mature aged and roughly half, not necessarily the same half, study at a distance, generally as part-time students. A significant number of CQU's students study at an International Campus (primarily Sydney, Melbourne and Brisbane) and pay full fees.

In the last several years the Faculty of Informatics and Communication (Infocom) has led the University in exploring the use of flexible delivery technologies (McCormack & Jones, 1998; Zelmer, 1997; Zelmer, Lye and Pace, 1996). The University does not have an appropriate

funding model for developing non-traditional materials and the staff members involved have used funding from external sources (CAUT, etc.) to develop techniques in advance of the more mainstream dedicated service units.

Infocom provides nominal workload support for academic staff revising study materials or developing new study materials. This nominal allocation is seldom adequate as the development of flexible learning materials for even a reasonably stable unit will take upwards of one thousand hours of staff time. Team development of unit materials is encouraged with a nominal workload allocated to each individual involved, but the results have been mixed with an unbalanced workload for a small number of individuals performing most of the work.

00101 INTRODUCTION TO MULTIMEDIA SYSTEMS

CQU's multimedia degree has an applied, rather than theoretical, focus and is relatively unique in that it is offered to students studying at a distance as well as on a campus. 00101 Introduction to Multimedia Systems is a core first year unit in the degree as well as being a popular elective for Information Technology and other students. It was designed as a 'fun' introduction to the broad spectrum of multimedia design and implementation.

The author initially delivered the unit on campus for two years (1997 and 1998) and was the lead developer of the CD-ROM and videotape-based resource package which includes a stock image library for assignment and project use. Student support is provided through a class web site, e-mail, fax and telephone. The web site is located at <http://infocom.cqu.edu.au/00101>.

Initial classroom delivery and beyond

The initial campus delivery (Zelmer 1997) ensured that both content and assessment for the unit were appropriate and provided some opportunity for coordinating the delivery of this unit with other units within the degree and the Faculty. Face-to-face presentations uses demonstrations of selected commercial and educational multimedia products ranging from multimedia encyclopedias to product promotions, games to children's stories depending upon the interests (and scrounging abilities) of the lecturer/tutor. As students become more aware of multimedia design they actively participate in assessing the presentations, turning what could be a passive 'show and tell' into lively discussions.

Tool demonstrations (tutorials on image manipulation, sound and video editing, etc.), some of which are pre-taped, are provided in smaller group sessions. The size of the class generally precludes an individual 'hands-on' approach but class participation is encouraged and examples are often taken from the students themselves. For example, a demonstration of

Photoshop's ability to manipulate images might use photographs of the class taken in a prior demonstration of digital camera use.

Three assignments lead the students gently into the discipline while providing scope for individual initiative. The first results in a PowerPoint presentation using lecturer-supplied visuals, the second has an optional group component to learn html techniques and results in a short report on a multimedia technology. For the third assignment students demonstrate a multimedia-related skill learned during the term. Submissions have included animation, analogue and desktop video, and interactive desktop or web presentations.

Infocom has used class web sites and e-mail as primary support for on-campus and distance students for several years. E-mail support includes a class discussion list as well as direct e-mail contact with the lecturer. A unit such as 00101 generates 10-20 messages per day on the class discussion list plus another 5-10 messages per day direct to the lecturer for every 100 students.

In 1999 the unit was delivered on four campuses, two of them International campuses, as well as at a distance. The 1998 teaching assistant cum tutor became the unit coordinator for the Rockhampton campus and distance delivery, with local staff delivering the unit on the other campuses utilising the resource materials described below. The results during the first 1999 term were encouraging with 68% of the students overall earning a Distinction or better (HD 163, D 73, C 31, P 14, F 28, NS 12, AF 23, RO 2, Total 346). There were no major differences between the various campuses but the distance students earned slightly higher marks overall with 74% earning a Distinction or better.

Learning resource challenges

Infocom policy only permits the degree to be offered on a campus where 'adequate facilities' are available for student and staff support. However, there are at least two views within Infocom about what constitutes an adequate facility. Policy on requirements for distance students is equally divided.

One view holds that students should be trained on the most current industry standard tools. This would mean introducing tools such as Adobe PhotoShop and Macromedia Director in the first year, followed by more advanced use of the tools in subsequent years. Graduates would be eligible to receive industry certificates as an expert user of designated tools. This implies a need for developer level multimedia computers and (constantly updated) advanced software tools for every student. Experience suggests that campus-based students would need such facilities both at university and their residence, with continuing and escalating costs for regular upgrades.

An alternate view insists that the degree should provide students with more generic skills. While they would still be introduced to industry standard tools, this might be done through tutorials using the save-disabled versions available with their textbooks and students would not be required to achieve expert status with these tools. More importantly, they should be able to submit assignments using any appropriate software which met their needs. This view infers a more economical level of hardware and software requirement, with more emphasis on the appropriate use of software, and appears more feasible for distance delivery.

Infocom decided on the latter strategy late in 1998, thus the only absolute software requirements for 00101 are a word processor, PowerPoint or 'an equivalent presentation package', an image manipulation tool for the supplied JPEG stock image files, a text editor, a web browser and Adobe's freely available Acrobat (pdf file) Reader. On-campus students have access to digital cameras and flatbed scanners; distance students receive a 'mail-in coupon' entitling them to a limited number of image scans through Infocom's IC-Assist student support service.

The 00101 learning resource package was finalised during and following the second on-campus offering of the unit and involved roughly 1500 hours of staff time. Staffing included the author as the principal developer, an instructional developer from DDCE (Division of Distance and Continuing Education), EMS (Educational Media Services) video producers, the unit moderator, tutors and markers. Another 250 unpaid hours were provided by a 'computing project' student and second year multimedia students assisting with testing and quality control.

The major student resource is a CD-ROM containing 624 Mb of unit and assignment materials, tutorials, sample assignments, a stock image and sound library, and video demonstrations. The CD resources are organised for access with a web browser and are also available on the class web site. A required textbook and a two hour videotape (What is Multimedia and Assignment Tips) complete the basic student resources. A list of over a dozen recommended texts directs students to additional resources in an area of multimedia specialisation.

Development challenges

From a staff perspective the effective use of technology is both time consuming and an almost impossible goal, not the least because the constant upgrading of both hardware and software results in a constant need for retraining and reskilling. During the initial two offerings of 00101, for example, there were major upgrades of tools such as Macromedia Director as well as the release of new tools such as Macromedia Flash and Shockwave. The same period saw

major advances in computer technology, including the release of Apple's G3 computers, and significant changes in the capacity and use of delivery mechanisms such as the Internet.

Several unit specific development issues arose as the development progressed but materials were completed in time for the 1999 delivery, albeit without adequate debugging and error checking. For example:

- Some attempt was made to overcome workload issues through the use of student labour. A student was hired to record and digitise the sound library and another worked for a term as part of his 'computing project' unit. Unfortunately the workload in this student's other classes prevented him working during a second term so that he failed to complete his project. Those colleagues involved in the unit development did so as an extra workload or, as in the case of the part time tutor, out of personal interest and on their own time.
- The development of materials for this unit and the requisite skills development (learning new versions of software tools, etc.) required four to ten hours per day of 'mousing' cum keyboarding for six to seven days per week for more than six weeks towards the end of the development period. This resulted in the author requiring medical assistance for OSS (Occupational Overuse Syndrome) and a rescheduling of timelines.
- Sample student assignments had been archived using software which enforced an eight character filename with a three character extension. Since references to the filenames in the presentations were not revised prior to making the CD-ROM, students must copy the files to their own hard drive and revise the filenames before they will function fully. All other links on the CD-ROM were verified on a Macintosh only, even though we expect that most of the distance students will be using a Windows-based computer.
- Some students experienced difficulties viewing the movie files due to a cross-platform incompatibility with the materials as supplied by EMS. The movies were subsequently recompiled and the revised versions posted on the web site, but the CDs cannot be corrected until a new order (1000 CDs) is required.
- Intellectual property issues involved in distributing materials on CD-ROM had been identified when developing materials for earlier units. These issues were resolved for this unit by writing original materials which were saved using the Adobe pdf format. Topics include case studies of multimedia practice summarised from media reports, 'how-to' items and Australian-oriented multimedia information.
- The specified 'required' text was selected from a number of available texts provided by publishers in 1998. At that time the publishers all indicated that their texts would be available for 1999 use. However, mid-January 1999 the Australian agent for the publisher of the selected text advised that the text was now out of print and they were substituting an earlier text by the same author. Since the Adobe software is not included on the CD with this text alternate distribution arrangements were implemented.

00202 MULTIMEDIA DEVELOPMENT

00202 Multimedia Development is the advanced multimedia project management and tool use unit and was delivered in 1998 on the Rockhampton Campus by another staff member who, unfortunately did not prepare the flexible learning materials required for it to be delivered on both non-Rockhampton campuses and at a distance. Thus, late 1998 the author was reassigned to develop the materials as his main duty during the first term in 1999. A DDCE instructional designer (fortnightly meetings), an EMS video producer (weekly studio/editing sessions), and three students hired to assist with quality control completed the informal production team.

The unit resources include 6 hours of videotaped tutorials and 'interviews' with multimedia practitioners, plus roughly 640 Mb of notes and tutorials on the CD. The class web site (<http://infocom.cqu.edu.au/00202>) delivers a sub-set of the CD materials plus a discussion board (web-based e-mail type discussion list), frequently asked questions and updates. A one hour videotape was also prepared to assist with the induction of lecturers and tutors delivering the unit.

Both on-campus and distance students receive the same resource materials, with the campus students having the support of face-to-face contact in the classroom and a multimedia computer lab. The unit assessment task is to document the development of a desktop/kiosk type prototype multimedia presentation and should enable many students to build on the project they initiated during the prerequisite unit, 00201 Multimedia Design, if they wish. Similarly, students could develop the prototype for a presentation to be completed during their third year project unit.

Philosophical challenges

Even more than in 00101, the type of software to be used and the level of industry-standard tool (software) expertise to be attained by students were the major issues facing the development of this unit.

As noted above, one group in the Faculty firmly believes that students taking the unit should be trained to an expert level in the use of a selection of industry-standard standard industry tools leading to the award of product-specific industry certificates such as the Advanced Macromedia Director Certificate. However, the Faculty did not believe it had the resources to provide the software required, estimated to cost a minimum of \$2,500 per student, particularly for the volume of students expected to enrol in the unit at a distance.

Others believe that students should learn enough about the capabilities and use of several multimedia applications so that they can choose the most appropriate application for a task, and be able to say to potential employers that they can use a selection of advanced applications at an intermediate level and are both willing and able to learn the employer's preferred applications. This approach has at least two difficulties. First, many staff are uncomfortable with being required to teach using several tools. It is unlikely that any staff will be familiar with all of the tools and potential staff on some campuses are unlikely to have expertise with any advanced tools. Second, the then current students had become convinced that they would not be employable without being expert Director programmers, evidenced by a portfolio containing several completed Director projects.

While uncomfortable with the potential difficulties, the Faculty's financial situation and the availability of an experienced unit developer (the author) willing to develop appropriate learning resources resulted in the adoption of the second position.

Students in 00202 can attain at least intermediate experience using appropriate tools for the preparation of their 00202 assignment, an activity which can involve further developing the design from 00201 Multimedia Design up to a prototype level. Furthermore, they will design and develop a web-based product for a pseudo-client in 00301 Network Multimedia and are required to complete a reasonably major 'project' in their third year, both of which will provide opportunities for further developing their tool using skills and their personal portfolios. Thus 00202 will be a step along the way, not the place where they complete their career-defining student multimedia project.

There are at least four requirements for generic multimedia learning activities to be effective. First a staged project has to be developed in advance by the unit developer. Second, all of the resources required for each stage of the project, and that means several intermediate stages for some products, must be available to the students. Third, the students must receive a decent instructional package to guide them through the exercise. Finally, the exercise must be repeated for several applications.

The 00202 package of resource materials developed and distributed for the Winter 1999 term includes multi-stage tutorials for Director and Photoshop (or similar image manipulation programs) plus less sophisticated tutorials in video editing, creating images for a variety of purposes and a basic presentation package.

Advantages of the fully prepared tutorials include permitting campus-based students to continue with a subsequent lesson without having to wait for other members of the class to

catch up and distance students work with the same materials, and get the same instruction, as the campus-based students.

Some students will always do the minimum required to move to the next stage, others will do everything required to complete the project to the same or a better standard than that provided in the unit materials, still others would do the minimum on some parts and work in depth in those areas where they were most interested or where they had the most time. In addition, a number of the students will purchase their own copies of the software to work the exercises more fully and/or have full featured versions of the software available through their employer or campus.

In summary, the development philosophy entails:

- Using an educational, rather than a training approach. In other words, the objective of the unit is learn to use, and to learn how to learn to use, a number of applications, not to be trained to industry certification level in the use of one or two.
- Using phased exercises and save-disabled industry standard applications, supplying all the components required for the completion of each stage of several exercises, for about four application areas. While these areas would change over time, appropriate applications could include PhotoShop, Director, Premiere, and Authorware.
- Students receiving videotape or other tutorial materials to accompany the exercises.
- Assignments being completed with those tools available to the student. This would include Authorware, a working version of which is included with the textbook.
- Supplying tutorial staff with full applications, including manuals, etc., for classroom demonstrations.

Deciding to restructure the unit so that students learn generic skills, rather than being trained to an advanced level in one or more industry-standard professional products, was the most significant decision in developing the unit. Since not all staff involved are convinced that the strategy is correct, it will be some time before we can assess its success.

Other development challenges

Other challenges affecting the preparation of the unit resources included the short deadlines, the necessity to upgrade the author's skills sufficiently to prepare tutorials in some of the software tools, the amount of time required and the limited facilities for preparing the tutorial videos, and the limited budget. Some representative examples are discussed below.

The author was fully involved with developing the 00101 resource materials until the end of 1998, on leave for much of January 1999 and recovering from the OOS incident with medical advice (mostly ignored) to reduce workload throughout the first half of 1999. Never-the-less

work on the 00202 materials began early February 1999 and was completed mid-May in time to ship the master CD to a capital city for duplication, copy the videotapes and mail the resulting materials to distance students prior to the Winter 1999 term.

While a detailed log was not maintained for the whole development period, extrapolating from a detailed two week log indicates developing the unit required roughly 1000 hours of academic staff time (primarily the author), over 100 hours of general staff time and 26 hours of [paid] student support for revising materials, proof-reading and quality control.

A detailed production schedule was not used. The EMS television studio was booked for one-half day per week from mid-February. This provided roughly seven taping sessions in the TV studio alternated with editing sessions and focussed the unit development. Topics and rough scripts were prepared as the tutorial materials were developed prior to each taping session. Basic and intermediate level materials, including the Photoshop image creation tutorials, were taped first, with the more complex Director tutorials left to the last. As far as possible one interview session was also organised for each taping session subject to multimedia professionals being available. The tutorial and other notes were prepared continuously up to the last day before the CD master was shipped for duplication. As well, a fortnightly coordination meeting with the DDCE instructional developer provided artificial deadlines to monitor progress.

The videos are a combination of unit introduction (31 minutes), tutorials and interviews. The tutorials (Photoshop, 67 minutes; Director, 48 minutes; and others, 92 minutes) were prepared and taped as if they were live classroom demonstrations. In other words, there were no scripts as such and the camera operator was required to anticipate the action as it progressed. While some editing was done to compress time, many of the author's 'mistakes' were left in to demonstrate typical pitfalls using the software and to remind students to regularly save their work, etc. Subsequent student comments indicate that this both humanised the tapes and highlighted areas where the students were also likely to have difficulties.

The eight interviews (120 minutes total) are the equivalent of 'guest lecturers' in the classroom and all but one were taped in the studio. Guests describe their work and its relevance to multimedia development.

While a suggested viewing schedule was provided for the videos, the students were advised that they could be viewed in any order once the unit introduction had been viewed. Notes to accompany several of the videos plus related tutorial materials are on the CD.

The computer and studio facilities limited the production quality as it was not possible to obtain a high quality image from the screen shots due to the low video resolution of the interface. While this resulted in 'banding', or even a loss of colour at times, it was likely no worse than the quality available from CQU's digital projectors and videoconference facilities.

A major limitation on the video tutorials was the steepness of the learning curve for the author as the tutorial materials were prepared. Several of the tools and techniques were new to the author and all sessions required preparing source materials in advance for every step/technique to be demonstrated. One of the Photoshop demonstrations, for example, required over 100 hours of advance work to prepare the multistage images and preparing the Director tutorial required more than twice that amount of time. In other words, developing the tutorials was time intensive and took the author far outside his 'comfort zone'.

As with 00101, copyright restrictions prevented the inclusion of paper-based readings on the resource CD. Accordingly over 20 original notes were written specifically for the CD. Following feedback on the 00101 notes, these were prepared in a landscape A5 size and saved in a pdf format to enable them to be easily viewed on screen.

The Study Guide provides a suggested schedule of readings and tutorials but primarily focuses on the assignment. Like the notes, it is presented in an A5 landscape pdf format for easy on-screen viewing. Unlike the notes, however, it contains some navigation facilities to allow students to quickly move between sections.

The 30 page Study Guide is the equivalent of 15 A4 pages, thus is not a comprehensive document. The unit materials are designed, however, so that the Unit Profile and Study Guide can be easily revised without affecting the other resources. Hopefully this will maximise Infocom's investment in the development of the resource materials.

The maximum storage capacity of a standard CD is roughly 650 Mb. As with the 00101 resource CD, it was difficult to fit all of the required materials onto the distribution CD. The solution for the 00101 CD was to include a smaller version of most of the video materials than was optimum. The solution for the 00202 CD was to eliminate almost all of the video materials except for a single demonstration, many of the alternate versions of source materials for the tutorials and over 1 Gb of potential extra resources. For example, some of the files illustrating the intermediate steps in developing the Photoshop images and a number of additional Macromedia tool tutorials were eliminated from the final CD assembly.

Ensuring quality control continued to be a problem with the tight timelines. The students who assisted with this included both students from the 1998 unit offering and potential students for

future offerings. They were able to catch gross errors and ensure that explanations were clear as well as assisting with converting (primarily Director) sample materials to multiplatform use.

CHALLENGES FOR THE FUTURE

Many of the 'challenges' arising from the development of unit learning materials arise from the skill level and idiosyncrasies of individual unit developers. The video materials for both 00101 and 00202, for example, were relatively easy to produce because of the author's media skills. However, the timely completion of the unit materials was delayed by the OSS effects of the unit materials preparation timelines and resulting workload. Timely production of quality unit materials is dependent on the resolution of such issues.

The University still has not developed an acceptable funding model for the distribution of costs between Schools/Faculties and DDCE for non-print materials. The Faculty was responsible for the total cost of the 00202 CDs, videotapes and web site, for example, even though they effectively replace the several hundred pages of paper which would otherwise be funded by DDCE. As well, the University has not resolved policy issues regarding the split of materials development costs between DEETYA and non-DEETYA students. EMS, for example, originally quoted the Faculty for the full commercial cost of the 00202 videotape production because the Faculty might be using the materials with full fee students at some time in the future.

The Faculty has never addressed the workload implications of preparing effective unit materials, and more particularly, unit materials for flexible delivery. It does take more time to prepare multiple versions of resource materials to cater for different delivery modes and learning styles. A nominal workload allocation of two-four hours per week for a twelve week teaching term does not recognise the work involved or provide a motivation for achieving excellence.

The Faculty's past practice of developing and expanding 'lecture notes' into a distance education package, regardless of the writing and teaching/learning skills of the campus-focussed 'lecturer', is increasingly inadequate for all students, not just those studying at a distance or those whose first language is different from that of the materials developer. For example, improving the grammar and sense of the writing, as well as reducing jargon and inappropriate language, has demonstrable benefits for all students.

The individuals involved in several flexible materials development projects within the Faculty would all likely agree that it takes at least 1000 hours to develop an adequate set of materials.

The workload on any single individual might be reduced through a team development process but the actual time required may increase because of the need for coordination between team members. Moreover, it is likely that the workload and stress level for the team coordinator will increase significantly as competing workload demands on individual team members will likely result in missed deadlines or minimised team involvement.

The Faculty has been at the forefront of CQU's flexible materials development for many years. The individuals involved have generally worked as individuals out of necessity and the results of their development work have often been poorly understood by the rest of the Faculty. We could argue that these individuals have a responsibility to inform the rest of the Faculty about their work, but the Faculty (and the University) has an even larger responsibility to ensure that this expertise in flexible materials development is properly rewarded and utilised.

Finally, the development of units such as were described in this paper are currently constrained by the lack of adequate on-line support facilities such as those developed by McCormack and Jones (1998). Staff and students alike would appreciate on-line tutorials and search tools, functional 'chat' facilities, videoconferencing, archiving of messages and discussions, uploading of assignments, on-line marking tools with automatic responses to students, etc. Infocom has devoted resources to providing a basic interface for managing on-line materials and on-line assignment submission. However, the results are not yet generally available and current support staff changes suggest that stable facilities may be further delayed. Infocom must ensure that support for on-line activities is adequate to provide efficient and effective services for all staff and students. Such services must include readily accessible 24 hour, seven day per week, 52 week per year technical support for novice users (staff and students) as well as for fixing the inevitable 'glitches' as they arise.

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