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ABSTRACT

The move by training and educational institutions in Australia toward the use of multimedia to facilitate effective and cost effective training and professional development has grown at a substantial pace. This paper focuses on the impact of multimedia on the areas of training and professional development. Benefits of the technology are described, including: cost and time savings; high student-teacher/trainee interaction; immediate feedback; consistent presentation; improved management of the learning process; content change management; flexible delivery; safe simulation environments; privacy; and increased instructional availability. Additional discussion includes professional development and training on the World Wide Web; differences between education and industry based training; the multimedia development process (job analysis, training needs analysis, instructional materials development, assessment, and evaluation); and criteria for evaluating computer assisted learning packages. (AEF)

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Exploring the multimedia landscape from a training and professional development perspective

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Overview of the landscape

Our society is witnessing a convergence of culture, power blocs, business and technology in ways and with a speed far beyond that of previous times or even prophesied in science fiction novels. The impact of this convergence is felt in almost every aspect of our lives. This paper will focus on the impact of multimedia on the areas of training and professional development .

Over the last twenty years motherhood statements about learning for life can be found in policy speeches as well as academic papers. In the early years it was seen as a desirable goal for the enrichment of our society. However now it is not an optional direction but rather an essential responsibility for the corporate, education and social elements of our society. The need for regular, flexible and continuous learning is apparent for participation in society generally as well as specific professional and technical fields.

The corporate environment has made a substantial commitment to staff professional development over many years.

> Systematic professional development and training has been a feature of the corporate world for many years. It may take the form of a one day workshop to introduce some new technology or management strategy. Or it might be a two day residential course offered in another city. Often at the same time as the new training is provided, team building strategies might be used to advantage. There is already tremendous expertise in training for professional development and life long learning in industry. (Nott, 1996.)

More latterly a partnership has developed between industry and TAFE colleges to deliver workplace based training often using computer assisted learning modes as the instructional design and delivery format. Swinburne TAFE has worked with Alcoa Australia, Mayne Nickless, Ajax Fasteners, Nestle, Tatura Milk Industries and the Department of Education South Australia. Western Metropolitan TAFE has worked with Don Smallgoods, GMH, United Dairy Farmers and the Victorian Racing Commission. All of these training programs have used CAL principles for the framework and delivery.

Within Australian academic institutions, training of undergraduates in particular skills has always been a feature. However there is now a more conspicuous move to address training using a variety of delivery modes. This is exemplified by the creation of the Science, Multimedia Teaching Unit at the University of Melbourne which is designing CDRom and Internet training programs for students. Deakin University likewise is a leader in the delivery of distance education using digital information.

Within the general education arena, EDNA (Education Network Australia), a Federal and State initiative, seeks to promote online education in the higher and vocation training and school sectors. The Directorate of School Education in Victoria is planning to use its website — **SOFWeb** to deliver professional development to teachers.

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The scope of the multimedia training delivered via computer assisted learning packages encompasses training which provides text, graphics, photograph animation, video sound and interactivity in combinations previously unavailable by traditional training and professional development methods. That is not to say that the use of multimedia in training overwhelms all traditional training strategies. Rather it offers extensions and in some instances replaces some of the most expensive or least effective segments of those traditional methods. Computer assisted learning can be presented via the World Wide web, CD Rom packages and disk based training packages.

It is important at this stage to define the term multimedia and to clarify its relationship with another term used extensively through this paper- Computer Assisted Learning or CAL.

CAL = multimedia + interactivity

where Multimedia refers to text, graphics, photographs, animation, video and sound and Interactivity is a programmed response to a user action other than basic navigation (moving backwards and forwards). Therefore (and this can be used in product evaluation), material for development in CAL form should deliver more than is possible with videos and books. For example, an electronic encyclopedia in its basic form is an example of multimedia and not CAL. It essentially only allows the user to navigate to different sources of information which can contain visual and aural elements. This could be done with video recorders and books, albeit far less conveniently. However, what does make an electronic encyclopedia CAL is its marvellous searching power, searching and retrieving information in ways not possible with video recorders and books.

Why is multimedia taken up by training and education bodies?

The move towards the use of multimedia to facilitate effective and cost efficient training and professional development has grown at a substantial pace. The motivation for embracing this mode for the delivery of professional development and training lies in the recognition by Universities or TAFE Colleges, Industry or Education systems that they have both a responsibility and vested interest in assisting graduates and employees to participate in lifelong professional development.

Specific reasons for this approach can be ordered under the following themes:

Costs

The total cost of an instructional program is equal to the combined costs of development and delivery. Multimedia based instruction tends to cost less for delivery and more for development. Instructor led instruction tends to cost more for delivery and less for development. Given a large enough population of learners to offset the high development costs, multimedia based instruction is cheaper to run than instructor led instruction.

Time saving

Industry experience shows that the majority of students complete a CAL course, having met the objectives, in significantly less time than with conventional courses. This is called "learning compression" and is becoming widely accepted as an important factor in justifying the use of computers in learning. Trainees usually find that CAL is much more demanding and intense than traditional approaches. Research reports seem to indicate that mental exhaustion sets in after two or three hours of CAL, which is likely to be the equivalent of a full day in regular classes.

It is a generally accepted rule of thumb that multimedia based instruction reduces instruction time by around 50 percent. Two possible reasons for this reduction are better instructional design and options to omit content that is not needed by the learner. This has particular relevance for industry as it reduces the amount of down time for staff.

Interaction

Computer assisted learning offers students the opportunity to learn through exploration rather than through tightly structured directed learning experiences. Research has shown that instructional techniques based on passive presentation methods- classroom lectures, videotape- result in very little actual learning, perhaps a few minutes in every hour. Most of the time the trainee is not attending to

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the instruction. In interactive, individualised instruction, the trainee spends a very high percentage of the time attending and hence learning.

Immediate Feedback

This has a beneficial psychological effect on learners since they have immediate knowledge of the adequacy of their performance. Where the performance is inadequate, CAL provides an opportunity to make good that deficiency.

In addition, a well designed program will not only explain why an answer is incorrect, but also reinforce correct answers because the learner may have guessed.

Consistent presentation

Trainers can become bored with presenting the same material repeatedly. They can have "off days" and days off through illness. They can also lack in-depth knowledge of parts of the subject that they are teaching or may place unnecessary emphasis on those aspects of a topic with which they are more familiar.

The "expert" on the other hand may be a poor instructor finding it difficult to teach the course. The use of multimedia can standardise course presentation. A well designed multimedia course is brought to life once and then used over and over again, possibly with only minor updates. Also, the best ideas over time can be incorporated into the course, creating an electronic "expert", one which can continually accept input for improvement.

Improved Management

Learner progress can be monitored and guidance given very effectively by incorporating computer managed learning (CML) into multimedia based projects. There is also potential for reducing the time spent by instructors on correcting test papers if appropriate sections of these papers are computer based.

CML affords a powerful method of establishing accurate records of trainee performance since the computer can automatically keep track of items such as:

dates when study was carried out
the time spent in each session
analysis of responses to each question.

By analysing group statistics, faults or weaknesses in course design can be accurately determined because a sound computer based course can give access to the responses to any question asked during the course.

Analysis of student answers is a great boon to improving course quality and responsiveness to individual learner viewpoints. If, for example, a particular learner obtains 40% on a test, a summary listing of his answers using CML may reveal that he spent an inordinate amount of time on questions 3, 5 and 11 and got them wrong anyway.

Other student records may now be accessed and it could be found that 90% of all students spent a lot of time on those questions, some answering correctly, some incorrectly.

It would now be clear that either of two situations exist:

the questions themselves are confusing
the material relating to those questions was not well presented

In either case, the action to be taken is well defined.

Change management

Content may change frequently. Non computer based systems and printed manuals cope with change awkwardly. Those parts of a course on computer can be updated very rapidly, particularly if there is a centrally located data source. If a computer based course has printed material associated with it, the more volatile material should be on the computer with the more static in printed form.

Flexible delivery

Often trainees or students have particular constraints on their availability. A computer in the workplace or at home can be used for instructional purposes day and night, often reducing onerous needs for travel.

This flexibility is important as learners can use odd times to study. The same situation applies to self study texts, but it often seems that sitting in front of a computer to learn is more acceptable and motivating than studying a self paced text.

By embarking on a course of instruction, learners with widely differing starting skills are expected to attain the same level of competency. The self paced nature of computer based materials means that the more knowledgeable will complete the course without becoming bored, while those with little starting knowledge will progress at their own pace without becoming lost. This is a motivating aspect of computer assisted learning.

Computer assisted learning also provides greater opportunities for practice compared to formal instruction. The computer is immune to tiredness and irritability in the face of persistent requests for "another go".

Safe practice

A computer is able to simulate real life situations with safety, allowing for experimentation and providing guidance on request. This particularly strong form of interactive CAL presentation is termed "simulation". Additionally, a lot of practical training has a low student/teacher ratio. CAL simulations can provide a one to one practice environment.

Privacy

Less knowledgeable learners are often inhibited from asking questions in formal classes, particularly involving more academic subjects. There is no stigma attached to repeating and reviewing sections of a CAL course.

Instructor Availability

Occasionally this can be the factor that offsets most others. If training is crucial and instructors are not readily available, the initial effort that is put into developing a CAL course may be justified even if the target population is small. This aspect becomes more important the greater the lead time involved in bringing a new instructor on line.

Professional Development and Training on the Web

Whilst most computer assisted learning packages are currently delivered using disk or CD Rom format there is significant experimentation with the Internet. The Internet and more specifically the World Wide Web offers a slightly different perspective on the design and delivery of computer based learning. "The Web supports multimedia and also the potential for the user to interact with it in ways that may enhance learning." (Nott, 1996) The advantages that have been identified earlier can be expanded.

Computer assisted learning has offered to the user the benefit that it can be delivered at times convenient to the user, whether that be in the workplace or at home. The Web extends that notion of any time any place. The equipment requirements of a networked computer at work or a computer with modem and telephone connection means that the training can occur at the discretion of the user and be delivered from anywhere around the world. Updates of material or email communication with the course supervisor can occur regardless of the time or the location of the supervisor. Not many supervisors enjoy phone calls at 6.00 in the morning but an email message sent at that time allows communication convenient to both parties.

Training and professional development on the Web enables a different level and scope of collaboration and team building because participants can communicate, share and work together regardless of their location. The variety of communication strategies available over the Internet have been built into the World Wide Web enabling video conferencing, computer conferencing, electronic

mail exchange, as well as participation on news services and bulletin boards. These facilities provide users with much higher levels of interactivity and feedback than can be experienced elsewhere.

Whilst it is not all plain sailing with Internet based training it does offer another option for the delivery of multimedia computer based learning and it is likely to be the area of greatest research and development over the next five years.

Differences between Education and Industry based training

Industry is concerned with Return on Investment

Education is concerned with Student Pass Rate

The objective of industrial training is to transfer learning to on-the-job skills

The objective of education is to improve knowledge, develop general skills such as analysis, research, problem solving in a general sense, not necessarily aimed at a particular vocation. In some ways, distinctions between education and training are blurred and not necessarily useful. For example, if I'm studying Accounting at a university, am I being educated or trained? Does it really matter?

The trend in much industrial training involves the development of problem solving, decision making, analysis and research skills, particularly in those people "lower" down an organisation's structure. Previously such skills were seen as only being necessary for supervisory staff. The quest for "lean and mean", quality conscious organisations has been instrumental in this shift of thinking. Consequently, much training material for industry is now being designed to exercise such generic skills in a vocational setting relevant to a particular industry or industry groups.

There may be a difference in how instructional materials are written for training or educational purposes. People involved in industry training have a wide variety of backgrounds and facility with the English language. This often means that more attention is given to the use of appropriate language levels than is the case in educational institutions. where more complex sentence structures are routinely used. Industry based multimedia projects often include a language and literacy consultant as part of the development team for this purpose.

Training requires that trainees see how the training is going to benefit them and that the new knowledge or skill is going to be immediately useful. Occupational relevance is therefore crucial. This can contrast with the more general purpose educational aims of "improved knowledge and appreciation" in a field of study.

Training is centred around the achievement of "competencies" which the trainee must be given at the outset of training. To quote from The Australian Qualifications Framework :

> (a competency is defined) as the possession and application of both knowledge and skills to defined standards, expressed as outcomes, that correspond to relevant workplace requirements and other vocational needs.
>
> It focuses on what is expected of the person in applying what they have learned and embodies the aoility to transfer and apply skills and knowledge to new situations and environments.(p1)

Multimedia development for training purposes is therefore very focussed on vocational outcomes. Educational outcomes on the other hand are usually defined as the content of a particular course, the development of specific skills and the focus is on the requirements needed to achieve the stated outcomes. The relationship between the learning and later usefulness is not necessarily clear.

The difference between multimedia development for education and industry may perhaps best be summarised by referring to the Instructional Systems Design model presented earlier. Education systems usually are only concerned with the arrowed stages whereas industry training takes in the whole sequence.

For example, a very common situation in educational institutions is for a teacher or lecturer to approach a developer with an idea to demonstrate an "interesting" concept. This may be a particular chemical reaction or the principles of triangulation or Newton's Laws of Motion and so on. Much educational multimedia development is based on the premise that "this would be interesting to do". Often, no particular regard is given to the financial viability of the project or whether the instructional aims could in fact be better and more economically achieved via print, or worse still, back in the class

room! Proposals for industry training however, invariably begin with the questions: "How much is this training going to cost and how will my employees and my company benefit from it?" The wise developer will be prepared with clear answers to these questions before the first meeting with management.

The Multimedia Development Process

For our purposes, a convenient model of Instructional Systems Design may be represented by the following stages:

Job (Skills) Analysis

The duties and tasks to be performed are identified, as are the required standards of performance.

Training Needs Analysis

Existing job performance is compared to required job performance and the training needs identified. Learning outcomes (course objectives) are defined. A Project Mission statement is developed and hopefully written down!

Develop Instructional Materials

Appropriate media are chosen to achieve the learning outcomes. Instructor-led, self-paced print and computer based components are identified. In multimedia development, this is a particularly critical stage. For example, content which is suitable for class room delivery to a particular group of learners, may not be as effectively delivered by computer assisted means, even to the same group of learners. Therefore, skilled, instructional judgement must be used to carefully choose those content areas which will benefit from computer assisted delivery.

In short, the skill of knowing when to apply what instructional tools is vital.

Instructional materials are prepared.

Assessment

Assessment is student (trainee) centred and determines if they are able to perform the tasks to the required standard of performance.

Evaluation (Validation)

Evaluation is training system centred and determines how well the training itself was designed and carried out in pursuit of the learning outcomes. This stage also tells us how well the learning has been converted to the required on-the-job performance ie. validates that the whole exercise was worthwhile!

Criteria for evaluating Computer Assisted Learning packages.

In assessing the value of CAL programs whether on Rom , disk or via the Internet it is important to view the evaluation from the perspective of the contracting institution or industry body, the multimedia authors, and the users or students.

The contracting institution or organisation are interested in value for money. The suitability of a course or professional development program for CAL delivery as opposed to face to face print based training, depends on criteria such as — instructor time saving, characteristics of the target population, likelihood of change, scope for interaction, currency and ease of updating, management. commercial possibilities and instructor availability. Pre and post delivery evaluation in terms of these criteria will provide one measure of the value of the a training program.

The authors focus on evaluation points such as content, accuracy and consistency of presentation. The purpose of uniform presentation is to make the computing environment as seamless and unobtrusive as possible and to promote trainee familiarity with the way material is presented. The 'tone of voice" of the program should be appropriate to the learners and consistent in style. Instructions must progress with the learner. The learning context must be sufficiently flexible so as to respond to the different learning styles and learning support required by each learner.

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> The current feeling is that one can perhaps give control to all of the learners some of the time, and to some of the learners all of the time, but one should probably not give control to all of the learners all of the time. A fundamental instructional design question is to determine what kind of control should be given when. (Naidu, S)

Finally learner based evaluation criteria could include pre and post test results, early identification of learner difficulties, progress and support relative to the needs of the individual learner, content, presentation, clarity, ease of understanding of content and instructions.

To view a more comprehensive analysis of evaluation models for evaluating open learning approaches and associated technologies it is worthwhile visiting the OLTC site which has an annotated bibliography of relevant literature. (http://www.oltc.edu.au/common/new.htm)

Summary

As industry and education strive for improvements in the effectiveness and efficiency of professional development and training new design and delivery modes are being explored. The impact that interactive multimedia programs is having on this area is growing and with the burgeoning of interest and access to the Internet new approaches are being explored further. What is a apparent is that the balance between traditional models of face to face professional development and training and those that are based on interactive multimedia will shift and that latter will become the preferred style for many organisations and institutions.

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