# Multimedia in Engineering Education: International Issues and Projects

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Higher education is infatuated with technology applications for education. Our interest here is two-fold. First, what is the future role of the university teacher in the new media environment, and second, is the development of these technologies changing the pattern of education in a transnational context?

## INTRODUCTION

New technologies are being used, or soon could be used, on many campuses to perform duties tradition-ally done by faculty members. Some lectures could be replaced by videos, CD-ROMs, on-line star lectur-ers from renowned universities, and World Wide Web sites. Technology advisers are working with faculty members on their classes and could assume a greater role in planning the curriculum. Computer-adminis-tered testing could be turned over to national or inter-national groups. Some educators see such potential developments as ways to enhance the educational process and to free up professors' time. Others fear that such a redefinition of academic duties could re-duce professors to discussion leaders with little con-trol over the curriculum and little role in students' lives. Has technology already had a significant impact on faculty roles? Are more radical changes coming? Are the changes that some people predict likely to improve or hurt the quality of education for students, and the quality of intellectual life for faculty members?

There appear to be three motivational issues in-volved in the question as it is now presented. First, what incentive is there for individual faculty members to adopt technology, either selectively or completely? Second, what incentives are there for departments or colleges to adopt technology for teaching, again either selectively or completely? Third and finally, what in-centives are there for universities to institutionally adopt teaching technologies?

Working from the last to the first, one might find that the answers become less clear. If universities are indeed competing for students, faculty, and resources, there are many incentives. Likewise, if departments and colleges are also competing for resources (stu-dents and institutional support), the incentives, although less clear, remain. The apparent absence of any in-centive for faculty members to adopt teaching tech-nologies goes to the heart of what a faculty member does. If we continue to believe that faculty members are hired, obtain tenure, and are promoted on the ba-sis of their abilities to teach, we might also believe there is some incentive to adopt teaching technolo-gies. Since, however, faculty in science and research oriented institutions are seldom hired, receive tenure, or are promoted based upon their teaching, the break-down in the incentive system rests squarely with the traditional system. As long as that remains the same, there will be few incentives to adopt teaching tech-nologies. We may see a dichotomy between predomi-nantly teaching-based institutions and science-based institutions. But with the outcry for assessment, prac-tical education and jobs, we may also have an effec-tive melt-down of the two types of institutional ap-proaches facing similar budgetary resource decapita-tion. There is a discernible increase of interest by in-formation technology and engineering educators in educational research and course production. This en-tails an encouraging stimulus towards educational re-search, the development of intelligent tutorial systems, and a general trend toward a scientific interest in the dissemination of education in disciplines other than education itself.

While some of our colleagues are talking about using technology in the laboratory and the classroom

as a teaching and learning tool, others are discussing the opportunities and challenges presented by on-line learning.

There are some connections though. To focus on the latter issue, as professors increasingly use the Internet and other new media technologies to deliver their curriculum and experience some degree of success, the inevitable seems to be closer. Our efforts should be spent on preparing for the virtual lecture theatre in the university system because our experiences to date present discussions on *when* and *how* rather than *if* professors will become course developers and information *routers* that facilitate learning. Much to the chagrin of the *fundamentalists,* the information is too expansive and accessible for us to agree that one must visit the classroom to acquire knowledge and skills, especially once we get better at delivering courses on-line

## THE ENHANCING FACTORS INVOLVED IN THE USE OF MEDIA FOR EDUCATION

In order to put the new media resources in perspective, we need to look at the change and possible enhancement of media disseminated courses.

Media implemented dissemination:

- improves productivity by eliminating the constraints of time and place;
- enables participants to communicate and collaborate quickly and efficiently;
- allows course content to be added or revised any time with no programming;
- can be used for self-paced, instructor-led, pre-training, refresher or certification courses;
- reduces the cost of training by eliminating travel expenses;
- increases the return of the overall training investment;
- turns instant learning into a competitive advantage.

## THE VIRTUAL UNIVERSITY

An example of how the web is becoming an international on-line education system is the Virtual On-line University, a new kind of educational institution that includes practical education in a student-centred, on-line learning environment.

Tools are based on open standards that are accessible and yet effective. New pedagogies and administrative methods are developed to make the best use of the new tools. In the example of the International Master in Business Administration, an international on-line partnership is providing the services and at least attempts to compete with the traditional methods. Success is yet to be measured, but the threats to traditional delivery systems have never been so strong. One active URL is http://www.athena.edu/

## THE PRODUCTION AND COST FACTOR

The cost factor is historically associated with the production and acquisition of books, chalk and blackboards and the provision of classrooms and laboratories; but it is the constant factor of faculty remuneration which really tips the balance books. This cost factor has turned into the creation of mass universities with huge classrooms, in contrast to the medieval individual relationships between professor and student. Laboratory staff is subjected to an increasing strain of resources and numbers to take care of complex experimental setups and guidance. Alleviating these constraints with virtual laboratories, on-line and off-line courseware, is an issue in the use of multimedia technologies. But the cost factor is complex and an order of magnitude larger in courseware and delivery costs. It involves:

- provision of multimedia technology facilities;
- staffing these facilities;
- providing services for faculty to implement their courseware production;
- course design and strategy for effective media-based teaching.

The costs of faculty are not being eliminated, this is an illusion. They are being shifted and probably multiplied. What we may end up with is paying for faculty as well for media-based interactive learning provision. The cost of effective production and dissemination of multimedia teaching is driving publishers and text authors to larger collaborations and a new and unique combination of resources in the production and dissemination of teaching material. A rethink of the traditionally funded and financially insulated higher education system is called for.

## THE HUMAN FACTOR

Beyond this reality check about the distribution and price of technological resources, another component is at work, and many of the responses reflect this understanding. Colleges and universities serve three basic functions: they create knowledge, they store knowledge and they transmit knowledge.

Computers certainly aid this process. But notice that we talk of *knowledge*. This is not the same as *information*. People who possess the technology can certainly gain access to a wide variety of information

that lies far outside the realm of the university, but transforming information into knowledge generally takes mentorship, teaching, molding, criticism, etc, and this requires some sort of human interaction. It requires the professor in the classroom, or the lab instructor, or the tutor in a seminar room, or e-mail conversations at two in the morning, or interactive full-bore videoconferences, etc. In other words, face-to-face, personal associations can suffice, but so can knowledgeable use of technology.

*Knowledge-age* technology has brought new players competing for the learner, new networks of learners, and altered political roles for faculty, students and support staff.

Faculty's new roles as mentor, guide, learning agent and scholar of the learning process have been met with limited, systematic training opportunities. Staff are only beginning to understand their new roles as process re-engineers, partners in the learning process and facilitator. Student services are just beginning to understand seamless front doors to education that allow students to navigate administrative databases. Students are just getting exposed to active learning modalities, especially their role as independent assessors of their own skill development.

Strategic thinkers and planners in higher education are challenged to re-examine available internal and external resources. We are at the threshold of a learner-centred culture that demands interdependent multipurpose space.

## CONCLUSIONS

The essence of learning depends on attaching individual or relevant meaning to the content at hand, in an environment that allows and encourages exploratory risk-taking. This can be accomplished in many ways. Individuals, possessing a variety of learning styles and behaviour, will continue to demand and benefit from a range of educational mechanisms. The needs of the *market* (so to speak) will continue to be varied. In turn, the responsibilities and objectives of the academic community will continue to be rich and varied. The impetus, need or sheer joy that drives the academic community (students and professors alike) to perform original work is not going to disappear.

Virtual learning is a tool that fills a need in the learning community. It may be a better or worse way of providing information and stimulating thought in the learner, but chances are that it will reach some learners who would not have otherwise been touched. This is an actuality that is not only commendable but crucial to the genesis and longevity of a vital learning community in our society.

The question as to whether new information technologies will radically alter the classroom is academic: it will. The questions are *how* and *when?* The dinosaur will either become adaptive and nimble or extinct. Tenure, administrative incompetency, bureaucracy are being challenged. Reform time is here.

## BIOGRAPHY



Michael Wald was educated at Cambridge University with a degree in Physical Metallurgy. He spent time in positions at the University of Illinois, Polytechnic University in New York and at the Fachhochschule Hamburg, and has published over 60 papers in engineering materials, engineering education and his current interest, multimedia in engineering education. He was first President of COMNET, the European Community Network for Education, Director of the University-Enterprise Institute in Hamburg, and is currently Editor-in-Chief of the International Journal of Engineering Education.

*The Application of Computer-Assisted Training Programs in Engineering Education*

**edited by Zenon J Pudlowski and Roger G Hadgraft**

This is the third volume in the *Monash Engineering Education Series*, established by the UNESCO International Centre for Engineering Education (UICEE) in the Faculty of Engineering at Monash University, Melbourne, Australia.

Publication of *The Application of Computer-Assisted Training Programs in Engineering Education* is the culmination of a successful UNESCO sponsored training course designed for young academic teachers conducted by the UICEE in November 1994 (and again in July 1997). Twelve academics from eight countries in South-East Asia and the Pacific region attended the course which focused on fundamental principles of the teaching/learning process, development of computer-assisted teaching programs and hands-on training in the application of a wide range of the latest computer software utilised in engineering education.

Development of the course was a collaborative effort on the part of several academics from various units within Monash University, carried out under the leadership of the UICEE. The material was then further refined for publication, based on research on the effectiveness of the course conducted at its conclusion by UICEE.

This course, and indeed this book, are the direct result of a UNESCO initiative to disseminate highly specialised teaching materials to science, technology and engineering educators worldwide. The book is therefore highly recommended to everyone interested in the most recent innovations in computer-aided teaching and learning.

To obtain a copy of this book (@ $A70), draw a cheque in favour of Monash University - UICEE, adding $A10 for postage within Australia and $A20 for overseas postage, and send to: UICEE, Faculty of Engineering, Monash University, Clayton, Victoria 3168, Australia. Tel: +61 3 9905 4977 Fax: +61 3 9905 1547.