

CJEC Special Issue on Teacher Education and Technology

David A. Mappin
Guest Editor

As the Faculty of Education at the University of Alberta concludes its year celebrating its fiftieth anniversary, it is with some pride we present this special issue on Teacher Education and Technology. There has been interest in innovative instruction and the possible application of technology to education in our Faculty since the time a School of Education was created at the University of Alberta in 1929. A portion of this early history, particularly as it relates to the work of M. E. LaZerte, the first Director of the School of Education and later the first Dean of Education, is related in this issue in the paper by Steve Hunka and George Buck.

The early interest in technology in the Faculty of Education at the University of Alberta has continued to the present day, but it could not be said that technology has become an integral part of education, or of teacher education. There continue to be a number of faculty members actively interested in the concepts and practices inherent in technology and the possibilities of using technology for learning, but they are a small number compared to the ubiquitous use of technology in all aspects of North American life.

However, neither this editorial nor this issue is intended as a platform for launching yet another tirade against the reluctance of teacher education institutions and education generally to be more proactive in utilizing the potential of technology for learning. What is intended is to explore some dimensions of technology as they pertain to education, and hopefully, provoke some dialogue regarding what the relationship of technology and teacher education should be and how that relationship might be realized.

In discussing technology and education there is the fundamental problem of agreeing on definitions of technology and educational/instructional technology. For some it is simply the tools for communicating; a toolbox containing the projectors, monitors, computers, cameras, videocassette players, and the slides, films, videotapes, laserdiscs, and computer programs which are dis-

played with them. Some extend educational/instructional technology to include descriptions of instructional strategies and instructional tactics which incorporate these tools, as well as the tools themselves.

Others expand the idea of technology further into descriptions and explorations of a field we call educational technology which in its classic definition by the Association for Educational Communications and Technology (AECT) "is a complex integrated process involving people, procedures, ideas, devices and organization, for analyzing problems, and devising implementing, evaluating and managing solutions to those problems, involved in all aspects of human learning" (1977, p. 12). This broad definition is generally associated with ideas of systematic instructional design. Still others have used the term instructional technology to refer exclusively to the processes, production, and delivery of learning events involving computers.

Outside of a strictly education context, technology has been defined by Galbraith (1967) as "the systematic application of scientific or other organized knowledge to practical tasks" (1967, p. 24) and by Forbes as "the product of interaction between man and environment, based on the wide range of real or imagined needs and desires which guided man [humans] in his [their] conquest of Nature" (1968, p. x). The first of these definitions presents the idea of systematic approaches to problem solution, and the second suggests the relationship of humans with nature, specifically in desiring to control nature. This desire has characterized sociological and philosophical considerations of technology for decades. Writers such as Leiss (1991), Franklin (1990), Ellul (1980, 1964), and Marcuse (1964), have reasoned about the larger, and in their writings primarily negative, impact of technology on humans and on their society. Others, like Toffler (1981, 1971), Masuda (1980), Papert (1980) and Bell (1973) have argued a more optimistic (and more populist) picture based on a more adaptive and positively creative vision of humanity.

Some of these more general views, particularly the negative ones, have influenced the attitude of many educators towards technology. Phrases such as "technical rationality" are often used to present their arguments, arguments primarily based in ideas of machines and mechanical connectivity held over from the past century. These criticisms deny the complexity of the biological and electronic metaphors which now pervade technology. They also fail to recognize the influence of cognitive psychology and the newer approaches to sociological and educational thought on educational technology and instructional design.

A single issue of a journal cannot present all of these facets of technology, the discussions around them, and the multiplicity of ways they relate to education. This issue is, perhaps, as notable for what is not present in the five papers which comprise it, as for what is. Some of these absent, but readily recognized, dimensions and issues continue to be important, even if neglected or only partially explored.

One of these absent dimensions is media education, the new iteration and extension of what used to be called visual literacy. It is one of the areas of

technology which should be crucial to education in today's world and yet it seems to have been a curriculum priority only in Ontario. It might be said that discussions with educators involving the role and importance of media are often more firmly rooted in conclusions solely derived from anecdotal evidence, an educational form of aesthetic relativism, than from any broad acquaintance with the growing body of literature on the subject. This would seem one area where more attention needs to be paid to technology in teacher education.

Cautious or often negative attitudes towards mass media frequently colour attitudes towards the use of instructional media. Such an approach is analogous to equating Harlequin romances with textbooks. Perhaps because it is so difficult to interpret and understand the ideas, emotions, images, and symbols conveyed in print, that trying to understand the somewhat different ideas, emotions, images, and symbols conveyed by visual media seem to educators to require an investment of effort they are not prepared to make.

Learning from images, however, is a critical part of the processes which touch on technology in education. Dale's (1954) idea of using visual media to provide vicarious experiences for learners seems to be worth resurrecting in today's world, where the materials with which students are allowed to work in subjects like science are curtailed by safety and cost concerns. In subjects such as social studies and language arts, visits to many locations in Canada and the world may be made easily via visual media, and these visits may include microcosmic and macrocosmic views. Such enhancements to learning are as useful today as they were when the arguments for them were developed three and four decades ago as a part of the audiovisual education movement.

The accumulation of decades of research in this area is supportive, but only in a tepid fashion. This can be attributed to years of studies yielding "no significant difference" results, studies which have compared the delivery of instruction by a teacher to the presentation of the same information by technological means, with a written test at the end. Such studies tended not to be described as focusing on the communication by images versus the communications by oral and print means, but as focusing on the communication by teacher versus the communication by film projector, or some other medium. Such studies were intended, in many cases, to provide practical support for the introduction of the innovative technologies of the day, rather than attempting to illuminate the ways in which students learned. They gave rise to ongoing, sometime vituperative debates on the replacement of teachers by film projectors, or teaching machines, or television sets, or whatever the bandwagon innovation of the day, the new saviour of education, was perceived to be. For example, Clark (1983) and Clark and Sugrue (1988) have provided some very illuminating analysis of the shortcomings of this approach to research in media and technology. It is important to remember that, for all their flaws, these studies repeatedly showed no significant differences in learning, even though the evaluation instruments were consistently biased toward print and verbal communications.

It is interesting to reflect on approaches to evaluating learning from images which could truly take into account the levels of understanding we derive from seeing, through visual media, a stream of glowing orange lava flowing over and consuming the organic material, while streams of volcanic ash darken the sky and people and animals flee from its path. Somehow, questions such as, what is the temperature of molten rock?, and what causes a volcano to erupt?, do not seem to explore the real dimensions of human response to such a phenomenon.

The role of computers in education is another vital area of interest with regard to technology and teacher education. Should teacher education programs be emphasizing the use of computers for professional productivity tasks involving word processors, spreadsheets, and other software, as many university courses for teachers currently do? Should they be emphasizing the use of computers as tools for problem solving and information retrieval as others advocate? Or should they be emphasizing teaching with computers, showing teachers in training how pupils can use the newer generations of powerful computer based learning programs to learn many concepts and skills more quickly and take control of their own learning? It would be exciting to see lively, informed debate on these questions throughout the broad educational community. Such debate might help us provide better answers and stronger elements of teacher training programs with regard to computers.

As previously mentioned, the gathering of support for the implementation of new technologies has been an important element of applied research for several decades. It might be surmised that this derives from the cost of technology and the cost of learning resources. Several generations of audio-visual specialists, librarians, learning resource directors, and instructional technologists working within schools have speculated on why it has been so difficult to obtain support for the provision of learning resources. This question persists as we continue to insist that the way to educate self-fulfilled, motivated human beings who can work and participate in a society which is increasingly technologically based and information reliant, is to have them talk to the decreasingly self-fulfilled, increasingly stressed human beings we call teachers.

What then is in this issue to explore issues related to technology and teacher education?

There is a noteworthy difference between educators interested in technology and the subset who describe themselves as educational or instructional technologists. Educational technologists are adherents to the idea that learners will learn more and become more independent and self-motivated if there is a focus on learning, rather than teaching. They see such a focus involving overt planning for or guiding of learners, and developing and implementing environments for learning which address those plans or guiding structures, employing some stated form of evaluation. The first two of the papers in this issue contribute to the discussion of educational/instructional technology and how it might relate to tomorrow's schools.

The first article raises the need for change within the public school system and what educational technologists might contribute to the process of change. Richard Kenny begins by arguing that there is a need for change and improvement in the public school system and that educational technologists can contribute significantly to the process. He explores that contribution with regard to three approaches to improving the public schools noted by Salisbury (1987). The three approaches were: school system reorganization; the teacher-training approach; and the diffusion/adoption approach derived from strategies of planned change.

In the second article Jim LaFollette examines the limited impact which communications and information technologies, and the more encompassing instructional technology, have had on schools. His discussion proceeds with reference to three metaphors for the application of technology; a tools metaphor, a systems technology metaphor; and a "systemic, gestaltic, and aesthetic metaphor". In concluding his arguments he uses the cyclical nature of the patterns of technological innovation and the rhetoric surrounding them to remind us, to paraphrase Eliot, that time present and time past need to be both perhaps present in time future. There have been many viable solutions demonstrated in the past, but their general acceptance on a large scale still has not occurred. The "challenge", as LaFollette puts it, is still with us.

Embedded in both the Kenny and LaFollette papers are numerous questions about the best ways to involve teachers in thinking about using technology in education. They are important questions in both the in-service and pre-service dimensions of teacher education.

Distance education is another of the topics which has become symbiotically linked with technology in education in the past two decades. Successful distance education may be seen to have a need for both instructional design techniques and an understanding of the communications and information technologies which maybe employed in it. Margaret Haughey examines these elements and the aspects of learners and teaching approaches which must be taken into account to create a successful distance education experience. She also outlines the implications such elements have for teacher education. These implications seem clear and straightforward. They are also very similar to suggestions made by other authors for helping beginning teachers increase the number of learning alternatives they can present to their students in conventional classrooms, and obtain the skills in using technology those beginning teachers need.

An important shift in instructional technology has been the movement away from a paradigm based in systematic design techniques and behavioral psychology to an exploration of other ways of designing instruction which involve different epistemological bases. While many of these have involved moves to cognitive psychology and the constructivist paradigms (Duffy & Jonassen, 1991; Jonassen, 1991), and others have explored "illuminative, semiotic and post-modern modes of inquiry" (Hylnka & Belland, 1991), there are other dimensions of developing instruction, particularly complex instruc-

tion for newer media. Katy Campbell-Bonar and Alton Olson have contributed to this special issue with a discussion of how elements of culture-building may be seen to influence the building of an instructional-design team environment for multimedia projects which makes maximum use of the knowledge and skills of all team members.

Finally, with the impact that computer technology has had on education in the past decade, and with reference to the fiftieth anniversary of the Faculty of Education, it seems fitting to end with a retrospective on the development of computing, and in particular CAI, in the Faculty of Education at the University of Alberta. The perspective of Steve Hunka and George Buck on these events might be challenged by others but the article is significant in that it paints the progress of one Faculty against the larger background canvas of educational computing in North America. There also remains the task of a companion piece which should be written to chronicle other audiovisual developments in the Faculty of Education, in particular the pioneering work done in the mid-sixties with educational television by Dr. John Fritz, Dr. Wayne Dralle, John Philpot, and other Faculty members.

CONCLUSION

Technology and teacher education remain unreconciled. Obtaining agreement on whether reconciliation might be achieved through evolution or revolution remains largely unknowable from previous experience, but the consideration needs to take place in a larger arena. Talking amongst ourselves is not enough. It is time to enter more vigorously into discussions with curriculum people, school reformers, educational philosophers, administrators, and others, and these discussions need to be undertaken in their forums. It seems vital to have the ideas surrounding the use of technology in education brought more into the forefront as ideas about school improvement are debated in some quarters, and the approach to more complete self-fulfilment for students is debated in others. Some provincial Departments of Education have been developing ideas of how technology and education may be brought closer together, and these ideas also need to be analyzed and considered at greater length as part of the proposed dialogue. A better understanding of what tomorrow's teachers should be learning in their teacher education programs should come from this. We know that the technologies will not remain static. As lower cost, higher volume computer memory becomes available; as markedly improved video compression algorithms move to market; and as our standards for moving very large volumes of data from point to point improve; the technologies which influence our lives will be even more ubiquitous, and provide even more possibilities for educators. Will we be prepared and able to deal with technology, to provide the kind of learning environments for students that will make the best use of all of the human and non-human resources we have? Or not!

The development of this issue made extensive use of both the *CJEC* editorial board and colleagues at the University of Alberta who provided their perspectives on the manuscripts offered for inclusion in this fiftieth anniversary issue. The editor would like to thank the following people at the University of Alberta for the advice and assistance they so willingly gave: Charles Bidwell; Katy Campbell-Bonar; Douglas J. Engel; Margaret Haughey; Grace Malicky; and Gene Romaniuk.

A particular thank you is owed to two others whose assistance was invaluable. To Jim LaFollette, thank you for the number of reviews you were willing to undertake on interrelated topics. They helped me maintain a consistent perspective. To Sharon Jamieson, thank you for the review work and for the editorial assistance you provided.

REFERENCES

- Bell, D. (1973). *The coming of post-industrial society*. New York: Basic Books.
- Clark, R. E. (1983). Reconsidering research on learning from media. *Review of Educational Research*, 53(4), 445-459.
- Clark, R. E., & Sugrue, B. M. (1988). Research on instructional media, 1978 - 1988. In D. P. Ely (Ed.), *Educational media and technology yearbook*. Englewood, CO: Libraries Unlimited.
- Dale, E. (1954). *Audio visual methods in teaching*. New York: Dryden Press.
- Duffy, T. M., & Jonassen, D. H. (1991). Constructivism: New implications for instructional technology? *Educational Technology*, 31(5), 7-12.
- Ellul, J. (1964). *The technological society*. New York: Vintage Books.
- Ellul, J. (1980). *The technological system*. New York: Continuum.
- Forbes, R. (1968). *The conquest of nature: Technology and its consequences*. New York: Praeger.
- Franklin, U. (1990). *The real world of technology*. Toronto: CBC Enterprises.
- Galbraith, J. K. (1967). *The new industrial state*. Boston: Houghton-Mifflin.
- Hlynka, D., & Belland, J. (1991). *Paradigms regained: The uses of illuminative, semiotic and post-modern criticism as modes of inquiry in educational technology*. Englewood Cliffs, NJ: Educational Technology Publications.
- Jonassen, D. H. (1991). Objectivism versus constructivism: Do we need a new paradigm? *Educational Technology Research and Development*, 37(4), 5-17.
- Leiss, W. (1990). *Under technology's thumb*. Montreal & Kingston: McGill-Queen's University Press.
- Marcuse, H. (1964). *One-dimensional man: Studies in the ideology of advanced industrial society*. Boston: Beacon Press.
- Masuda, Y. (1980). *The information society as post-industrial society*. Tokyo: Institute for the Information Society.
- Toffler, A. (1971). *Future shock*. New York: Bantam Books.

Toffler, A. (1981). *The third wave*. New York: Bantam Books.

GUEST EDITOR

David A. Mappin is the Director of the Instructional Technology Centre,
Faculty of Education, University of Alberta, Edmonton, AB T6G 2G5.