



BOARD OF STUDIES
NEW SOUTH WALES

OCCASIONAL PAPER

Workshop on Information and Communication Technologies and the Curriculum

Held at the Board of Studies NSW,
February 1999

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July 1999



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Published by Board of Studies NSW
GPO Box 5300
Sydney NSW 2001
Australia

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ISBN 0 7313 4353 0

July 1999

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FOREWORD

Most chroniclers of social and economic change are agreed on one thing: the information and communication technologies (ICT) are having and will continue to have a profound impact on us all. As the twentieth century comes to a close, the zeitgeist is clearly dominated by the information revolution with its emphasis on digitisation and instant communication and retrieval of knowledge. The development of vast interactive and interconnected networks, which cross traditional barriers of space and time, is proving extremely difficult to regulate and control.

Media and technology corporations see the potential for huge profit in attempting to control the supply of information and are racing to get more efficient search engines and faster access servers. While huge profits are being made and lost in some of the more speculative ventures, the direction of change is relentlessly moving faster than any one interest can predict and control.

The information and communication technologies present some of the biggest challenges to the established order in all our institutions, including our institutions of learning. Yet I believe it is true to say that at this stage we are having some difficulty in envisaging where we will be in the near future.

We need to work towards a better understanding of the direction of the information and communication technology revolution so that we can be effective managers of the change in our sector. At this stage, there appears to be a considerable gap between the rhetoric of the technoenthusiast and the reality of contemporary experience in the classroom.

This paper, prepared by Andrew Goodyer, summarises the discussion arising from a workshop held at the Board of Studies NSW, which attempted to determine the basis for further work on how best the Board should address these important changes.

Professor Gordon Stanley

President

WORKSHOP ON INFORMATION AND COMMUNICATION TECHNOLOGIES AND THE CURRICULUM

Held at the Board of Studies NSW, February 1999

INTRODUCTION

In February 1999, the Office of the Board of Studies NSW hosted a one-day workshop on Information and Communication Technologies and the Curriculum. The workshop was attended by a small invited group of experienced educators with a broad knowledge of technological implications and interest in global directions in curriculum and assessment, rather than people whose primary interest is in technology itself. Workshop participants came from New South Wales, Victoria, Western Australia and New Zealand (see Appendix).

The focus of the workshop was on the identification and exploration of the broader educational implications of the new information and communication technologies and to formulate directions for appropriate responses in such areas as policy development, research projects and curriculum and assessment approaches. This report summarises the discussions of the workshop, initially identifying some of the major technological changes and their current impact in schools. The report then goes on to discuss workshop participants' views of the implications of these changes for the nature of learning and the skills required by students. Later sections look at the changing role of schools and teachers in the light of these developments, together with broader issues of curriculum and assessment.

1 DEVELOPMENTS IN INFORMATION AND COMMUNICATION TECHNOLOGIES

By 2010, it is reasonably certain that what are now described as the new information and communication technologies will be part of the regular infrastructure of society. The rapid growth of the Internet and the converging technologies suggest that the potential availability of information and level of global interconnectedness will be of an order of magnitude that has not been envisaged before.

Two prevailing views may be discerned regarding the implications of these changes for education. The first view sees the changes as incremental, with the basic educational issues remaining unchanged and the new technologies being integrated progressively into pedagogy and curriculum. The role of the new technologies is seen as instrumental rather than conceptual and like other technology in education, they are seen as supporting pedagogy rather than changing the nature of learning itself.

An alternative view sees the emerging technologies as representing a paradigm shift, perhaps analogous to the invention of the popular printing press, where technology had a dramatic impact on what was considered important in education. Prior to that time, the capacity to memorise and accurately recall information that was passed on was seen as extremely important but with the ready accessibility of printed material, rote learning became less important and other skills, such as the analysis of information and problem-solving, became more important.

The general view of workshop participants was that we were on the cusp of a paradigm shift with profound implications for the nature and delivery of education. The next section describes some of the changes that are already apparent in technology-rich school settings.

2 CHANGES EVIDENT IN TECHNOLOGY-RICH SCHOOL SETTINGS

Some insights into the likely trends emerging in schools, as the new technologies become ubiquitous, can be gained from those schools that are already some way along this path. Workshop participants described the experiences of schools where programs have been implemented providing every student with 1:1 computer access (eg through laptop programs) and ready access to the Internet. Some of the resulting changes are identified below.

Student Changes

- students enjoy learning more
- students spend more time in class, on task
- students are more engaged in higher order learning, where they are synthesising and analysing information
- students become more confident and independent
- cooperative learning and problem-solving is promoted
- quality and diversity of student presentation of work improves, together with corresponding increases in self-esteem and confidence
- hypothesis formation and testing skills improve
- students learn to be more discerning in their selection of information from external sources
- students learn metacognitive ('thinking about thinking') skills

Pedagogical Changes

- the teacher's role becomes more facilitative and less directive
- new types of problem-solving and information synthesis are engendered
- abstract material can be approached in new, more concrete ways
- provides opportunities for a wide range of student abilities
- able to access and integrate a wide range of information sources
- learning becomes more student-directed, less teacher-directed
- increase in 'discovery learning'
- assignments can be more interactive — use of animations, graphics, sound, text
- assignments go through an interactive process of drafting and refinement
- technology enables more sharing of student work and more ready feedback to students

School Organisation Changes

- physical layout of classroom changes — students seated in groups around a hub
- increase in number of ‘non-teacher’ staff

Workshop participants noted that there was great diversity of school practice and changes such as those described above, tended to be confined to individual schools. The extent to which this was dependent on key individuals within the school and whether changes were transferable to other schools was unclear. It was also noted that more holistic change may be more likely in primary schools than secondary schools, which tend to be more constrained by timetable, syllabus and assessment requirements.

3 STUDENT SKILLS

In the light of the technological developments that are occurring and changes that are already evident in some schools, the workshop considered changes in the nature of learning and the student skills that would be needed in this new environment. Apart from the direct skills required to use the new technology, students would need skills to navigate and evaluate the vast amounts of information that would be available to them. This information would not necessarily have gone through the authentication and quality review processes involved in conventional publication and thus, students would need appraisal skills to judge the likely veracity of information sources. In addition, students would now have greater access to primary sources via the Internet. Given the ‘techno-familiarity’ of much of the current generation of students, it was suggested that more focus may need to be placed on the ‘information’ part of Information Technology rather than the ‘technology’ part. It was noted that there may well be an increasing significance on outcomes traditionally taught in the humanities, such as skills in research, analysis of text and other data, judgement of the credibility of material and the selection and filtering of information.

Other issues raised in relation to student skills included:

- changes in the role of teachers (discussed below), which imply that students will also need skills to empower them to make decisions about and direct their own learning
- the value placed on group learning and teamwork in the workplace, with the observation that while this should be encouraged by the new technologies, there was a risk of increasing isolation and thus, schools needed to incorporate approaches to encourage cooperative learning in students
- community pressure for an increased emphasis on values education.

4 THE ROLE OF THE TEACHER

Teachers were seen as playing a key role in implementing educational changes arising from the new technologies. Schools with a heavy investment in technology noted that, in some ways, installing the equipment was the easy part of the process and that they were grappling with the issue of what teachers need to be able to do in this new environment. As noted in the previous sections, information technology has the potential to shift the focus toward student-directed rather than teacher-directed learning. It was felt that while the nature of teacher-student interactions and roles may change, the

teacher's role will not diminish in responsibility but rather change in nature as students are given more power in determining the direction and means of learning. A paradigm shift in focus from 'teaching' to 'learning' will result in teachers adopting a role as guide, facilitator and leader, rather than acting as the seat of authority and knowledge. Participants described this as the 'democratisation' of the classroom, with students having access to a wide range of specialists and information sources on the Internet.

Changes in the traditional role of teachers may result in an increasing number of specialist staff in schools with different roles in helping students learn. It was noted that librarians were at the forefront of technological developments and information management and had the skills to act as 'information brokers' in the school. Participants also saw the potential to train professionals for specialist roles within schools (eg development of curriculum, implementation of curriculum, support of learning) and also for different 'levels' of teacher to evolve, such as 'master teacher' (in charge of large groups) while other 'teachers' work under supervision with smaller groups.

An example of the new facilitative role of teachers may be teachers setting up their own web pages to guide their students to appropriate information sources. System authorities may similarly assist in providing resources and quality checks for students and teachers in accessing appropriate websites.

5 TEACHER DEVELOPMENT

The importance that workshop participants placed on the changing role of the teacher was matched by a concern about the development of the necessary skills in teachers. It was felt that there was a mismatch between how the current generation of teachers approach the acquisition of knowledge and how their students acquire knowledge in the new information context. Many teachers were felt to lack familiarity and comfort in working in this environment and their training and experience had not provided skills in the use of technology or an understanding of how to incorporate it into courses they deliver and tasks they set for students. It was noted that students are often more familiar with this technology than their teachers.

Participants identified a number of potential impediments to the development of these skills in teachers:

- lack of necessary changes in teacher-training programs
- average age of current teaching and teacher-training staff and lack of technological familiarity
- rigidity of design of school buildings and classrooms
- problems in attracting students to the technology components of teacher-training courses
- shortage of teachers in critical areas (eg Technology and Applied Studies)
- good teachers with Information Technology skills are highly valued in other areas of the workforce and are often lost to teaching
- the need to address the training needs of teachers re-entering the teaching workforce
- the need to integrate technology and information skills through individual discipline areas of teacher-training as well as for teachers who want to make a special study of technology
- teaching is seen as a profession that values contact with people; thus, there may be difficulties if technology is seen as diminishing contact between teachers and students

- potential industrial issues arising from such issues as changes in teachers' roles and authority, contact hours, flexible delivery modes and workload
- other pressures on teachers, including tighter regulation (competencies, workload etc) and greater public interest in accountability
- the lack of a research base to inform the changes in teaching and teacher-training required
- economic constraints on training and equipping teachers and schools (although it was noted that the 'costs of entry' of technology in schools were dropping).

6 THE ROLE OF THE SCHOOL

Developments in information and communication technologies were seen as having a variety of potential effects on the role of the school. Technology provides greater opportunities to cater for the individual needs of children and to tailor learning opportunities to these needs. It also provides increased learning possibilities without the physical presence of a teacher, enabling schools to offer a wider range of courses. Students can access information outside the physical resources of schools or libraries and alternative approaches, such as home schooling or small groups of students working in other settings, were reported to be increasing because of the Internet and other technologies.

Workshop participants speculated further on potential uses of technology in information delivery. For example, in the future it may be possible for a group of experts to develop software which is very good for teaching desired outcomes (eg optimal for teaching basic numeracy skills). Schools could, in effect, outsource this part of their delivery by the use of this software (as already happens with some components of university courses). This was seen as representing an extension beyond commercial textbooks currently used in schools, incorporating the interactive capacity and other features of the new technologies and potentially providing an efficient and effective means of transmitting information.

While the importance of schools in the direct transmission of information to students may diminish as alternative methods of acquiring knowledge increase, schools were seen as being of continuing importance in providing a sense of community and in the transmission of values and traditions. Some participants felt that some of the aspects of school which are currently regarded as more peripheral, such as music, drama and sport, will become more central to the purpose of gathering children together in the 'community of learning' known as a school. The concept of the school as a 'community of learning' could also be expanded by extending the opening hours of schools and making their resources more readily available to the broader community.

The workshop spent considerable time on issues to do with the effects of technological advances on social interaction, with a range of views being expressed. It was felt that most learners have a need for social contact and collaborative activity. The first virtual university in the United States has subsequently established a physical campus as a result of student requests. It was noted, however, that social interaction does not necessarily require face-to-face contact and in fact more effective interaction can sometimes take place in a virtual setting. In some settings, such as university lectures, it was not meaningful to speak of social interaction between the teacher and the large group of students. In addition, there was evidence that the use of the new technologies in classrooms did not lead to isolation but rather that their effective use required collaboration. Recent technologies have also improved opportunities for social contact in traditional distance education settings.

Participants identified a number of issues for consideration in regard to the future role of the school, including:

- How critical is social interaction?
- What is the minimum level of interaction required?
- How can this be packaged to occur?
- What are the opportunities in the school environment to expand the ways in which people learn?
- What sort of regulatory concerns arise in relation to alternative approaches to schooling and the transmission of information?

7 CURRICULUM

7.1 Curriculum Issues

In the light of the changing information environment and consequent changes in the roles and requirements of students, teachers and schools, the workshop moved to consideration of the implications of these changes for curriculum.

It was noted that alteration of syllabuses as a result of technological and other developments already occurred, for example, the de-emphasis or deletion of sections dealing with log tables or fountain pens. However, such change was felt to be relatively slow compared to the changes that would be necessary in a context of greatly increased availability of information and level of global interconnectedness. Among the issues which needed to be addressed were:

- What content is essential? Is content to become more skills-based?
- Is content still based on subject disciplines?
- How can essential content be packaged so students can access knowledge and information in different ways?
- To what extent should syllabus documents specify pedagogy?
- Who decides what content is relevant in syllabuses? Who decides on a day-to-day basis in schools?
- What is the place of Information and Communication Technologies in the curriculum?

Workshop participants noted that these issues would need to be the subject of considerable research and discussion in order to best inform the decisions of curriculum and other authorities. Some of the points raised in the workshop are summarised below.

7.2 Curriculum Content

Debate around the extent and nature of essential content to be included in the curriculum was seen as ongoing and subject to a wide range of social, community, political and other pressures, as well as changes in the information and communications environment. It was also noted that there had been a general move in syllabus documents toward an outcomes-based approach. Within this approach, the

focus of the syllabuses moves towards required student outcomes rather than the coverage of specific content. Nevertheless, there was evidence that moves to increase accountability and the introduction of system-wide assessment instruments have resulted in some new syllabuses having an increased emphasis on content (eg junior secondary syllabuses in NSW).

As discussed in section 3, a number of student skills were identified as being of increasing importance to students, such as the ability to access, analyse and use information and the skills of critical awareness and evaluation of evidence from many sources. It was felt that it was important that students learn 'how to learn' and how to teach others, not just specific facts. An extreme position advocated by some authors is that, since knowledge is both readily accessible and also liable to change or to become less relevant, it is not necessary for students to be taught many facts at all. However, workshop participants reasserted the importance of mastering basic material in order to proceed to higher levels of understanding and they noted that difficulties can arise if information sources (electronic or otherwise) are not available when the information is needed.

7.3 Subject Disciplines

The workshop raised a number of points regarding the future of a curriculum structure that had traditionally defined content and outcomes in terms of subject disciplines. The views expressed included:

- educators tend to be captured by the current discipline boundaries and traditions in which they operate
- cross-disciplinary courses may have lower status and find it hard to justify their place in curriculum
- there are some instances of a breaking down of subject boundaries because the structure of disciplines don't meet student needs (for example, innovative work in middle schools has led to less segmentation in courses)
- the structure of information and knowledge and the way in which it is recorded tends to vary across disciplines and thus, different skills and knowledge may be necessary to access this information in different disciplines
- skills that were previously the province of particular disciplines (eg skills in evaluating the veracity of evidence traditionally used in the humanities) may become an increasingly important skill across disciplines
- currently, the conventional procedure is to develop syllabus documents for each subject then delineate the developmental outcome stages in that subject. One alternative to explore would be to start with the developmental stages then move to subject outcomes that illustrate each developmental stage. This may lead to more widespread adoption of integrated or other types of approaches.

7.4 Delivery of Curriculum

In addition to issues relating to the content of curriculum, the new technologies were also seen as having implications for how that content was delivered to students. For example, one consequence of changes in the way in which information can be accessed may be that the context and level of

sequencing that have been an integral part of current documents is no longer sustainable. Technology can instantly provide information out of context to enable students to make all kinds of comparisons of a kind that in the past weren't possible. For example, it is possible to juxtapose readily available information from ancient times with modern information. This greatly expanded capacity to extract and line up all kinds of things calls into question the traditional linear way of sequencing material and the types of themes in current curriculum documents. However, it was also noted that, while computers free up the sequencing of content, the process of learning may have a sequence and some content is a prerequisite to further or higher levels of content.

The workshop expressed a variety of views on the extent to which syllabus documents should include information on the delivery of curriculum. On the one hand, it was felt that material on the conditions that are best for learning in a subject area needed to be in syllabus documents for that subject. However, the view was also expressed that the distinction between pedagogy and curriculum must be sustained or else the implication arises that there are designated ways of learning as well as designated things that must be learned.

There was also a strong view that curriculum documents must be congruent with the flexibility of learning approaches that the new technologies engendered. In this regard, it was felt that the current curriculum in senior secondary schooling in particular, was dominated by external assessment requirements with resultant issues, such as tight constraints on time and large amounts of prescribed content. Strong community and political pressures related to assessment and school results also tended to constrain flexibility.

Workshop participants also raised the issue of who makes decisions on the content and delivery of curriculum on a day-to-day basis in schools (eg systems, schools, teachers, students) and how these decisions are made. A more flexible curriculum structure provided greater opportunities for experimentation and extension in classrooms and for the inquiry and learning that was felt to come from a student-directed 'need to know'.

7.5 Other Curriculum Issues

Other issues raised in the workshop in relation to curriculum included:

- the place of the new technologies in current and new curriculum documents — as a delivery mechanism, as the subject of content, as a resource for students
- the need for curriculum to foster excellence and provide sufficient opportunities to challenge all students and the potential role of the new technologies in assisting this
- quality issues relating to websites and the desirability of support to teachers in providing guides to appropriate sites
- the need to recognise that students learn huge amounts outside school via the media and other technologies
- a perception that there was a renewed importance placed on values and ethics in both educational and other settings (eg business).

8 ASSESSMENT

Although the primary focus of the workshop was on curriculum, participants also raised a number of issues relating to the implications of the new technologies for student assessment, including:

- the growing demand for assessment instruments to cater for students whose primary tool for writing is the computer
- the improved presentation of student projects and other work engendered through the use of computers (although it was noted that teachers needed to be aware of over-rewarding presentation at the expense of content in marking such work)
- the improved analysis and reporting tools available through information technology, enabling more comprehensive reporting at the student level (eg student profiles) and at more aggregated levels (eg school benchmarking) and providing the means to address increasing community demands for information on the quality of learning outcomes
- the development of more interactive testing modes, such as computer adaptive testing (where students' responses are used to determine the nature of the subsequent test items that are presented) and the integration of formative assessment into the teaching learning process (for example, by the computer immediately suggesting additional resources to students based on their assessment responses). It was noted that computer adaptive testing may tend to encourage particular types of items or content (eg based on discrete facts) and also that there was a danger of students learning test response skills rather than the content of the test itself
- the need to explore methods of assessing some of the student processes and outcomes that may become more important in the new technological environment (eg project work and teamwork).

9 THE WAY FORWARD

Workshop participants expressed the view that a research base for many of the issues raised in the workshop was lacking. In particular, it was noted that much of the research was concerned with student use of the new technologies, rather than more fundamental curriculum and pedagogical issues. There was a clear need for more research in a variety of areas and a requirement to direct these issues to the attention of universities and other research institutions to enable them to be incorporated into research agendas. The crucial importance of teacher preparation was also emphasised.

Participants saw the need for curriculum and other educational authorities to:

- be proactive in addressing these issues
- elaborate and put structure on the themes raised in the workshop
- identify priorities that need to be addressed in a more structured way
- develop a framework for handling the impacts of the new technologies
- provide greater clarity on the lines of future action and policy direction that needs to be taken.

APPENDIX: WORKSHOP PARTICIPANTS

Professor Gordon Stanley	President, Board of Studies NSW
Mr Paul Albert	Chief Executive Officer, Curriculum Council, Western Australia
Ms Elizabeth Eppel	Group Manager, New Zealand Ministry of Education
Ms Susan Harriman	Chief Education Officer, Learning Technologies, NSW Department of Education and Training
Mrs Gillian Moore	Principal, Pymble Ladies College
Mr Peter Morrow	Assessment Officer, New Zealand Qualifications Authority
Professor Robert Pascoe	Dean, Faculty of Arts, Victoria University
Ms Dagmar Schmidmaier	The State Librarian, State Library of New South Wales
Ms Jozefa Sobski	Deputy Director-General (Development and Support), NSW Department of Education and Training
Ms Elaine Wenn	Assistant General Manager, Assessment, Board of Studies, Victoria

Office of the Board of Studies

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Mr David Patterson	Manager, Planning & Development
Ms Carol Taylor	Manager, Assessment
Mr Andrew Goodyer	Chief Project Officer