Using ICT for Quality in Teaching- Learning Evaluation Processes

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Abstract

ICT does not automatically add quality. There is however, growing evidence that ICT application to the core business of education can accelerate and improve learning on a number of fronts. It can also provide the means of gathering, connecting and analysing data about teaching and learning in ways that enable us to more accurately diagnose student need and evaluate programs. To apply ICT in these ways requires changed approaches by educators.

This paper looks at the contribution that ICT can make to quality in teaching, learning and evaluation through improvements in cognition, pedagogies, convergence, culture, and data.

Introduction

ICT does not automatically add quality to teaching and learning. It is possible to use information and communication technologies for trivial purposes, to waste students' time with information and communication technology or even worse, to use information and communications technology for destructive or immoral purposes. We can certainly use ICT to further entrench inequalities and to favour particular groups. There is evidence in the USA, for example, that African American and Hispanic students are given more repetitive drill and practice tasks on computers and fewer sophisticated simulation applications than their white peers [Weglinsky 1998; Kreuger 2000].

There is however, growing evidence that ICT application to the core business of education can accelerate and improve learning on a number of fronts, from basic skills (Mann 1999; BECTA 2000); problem solving (Oliver and Omari 1999; Williams 1999), information management (Peabody 1996), work habits (Adnanes 1998), motivation (US Congress 1995; Allen 2000;Combs 2000;Diggs, 1997; Sherry, 2001), establishing life-long learning habits (Schollie 2001) and concepts development (Yelland 1998). In addition, information and communication technologies are being applied to the management of learning and to the business models of educational delivery. One recent report that evidences this trend is the USA based, Year Four CEO Forum School Technology and Readiness Report [CEO Forum 2001]. This report links assessment and accountability with access, analysis and most importantly, alignment. These concepts will be discussed later in the paper.

Educators therefore have a choice. We can push the boundaries of information and communications technology in education, seeking to exploit its capacities to improve our outcomes by extending us beyond the limits and paradigms we currently experience or we can limit it to the boundaries that we currently know, challenging only our technical skills. If the teaching profession and mainstream educational institutions follow this path we will be overtaken by newer, more commercial models of ICT enabled education. Ignoring it is not an option at all.

This paper looks at the contribution that ICT can make to quality in teaching, learning and evaluation through improvements in cognition, pedagogies, convergence, culture, and data.

Cognition

There are several levels on which ICTs can push the cognition boundaries. New media allow us to represent in rich and diverse ways. This is not simply a matter of learning styles although diverse learning styles can be supported by ICT. New media enable us to traverse the boundaries of art, science, language and senses. They allow us to represent and simulate experience. ICT allows us to accelerate or decelerate processes for purposes of understanding. Just as an experiment allows us to reproduce, represent or test a pattern of activity in the physical world, multimedia allows us to represent and experiment in a 'virtual' world – transferring control and concept to the learner in new ways. We can improve safety, for example, using technology (the difference between a flight simulator and learning in the air) so that the concepts are transferred, confidence is built through simulated experience and skills are developed, long before the risk has to be taken.

Eliot Eisner (1998:105)) claims:

Everyone knows what a culture is – it is a place for growing things, and schools are places for growing minds (Cole1985). The curricula we offer and the teaching methods we employ are means for creating minds. It is in this sense that the curriculum is a mind-altering device (Bernstein 1971) and the school a culture of growing minds. As this conception of mind takes root in our conceptual life, it creates an optimism for education for it emphasises the possibilities of schooling, its capacity to make a difference in the kind of minds that students can come to own.

The best cognitive understandings and practice can be captured and communicated by ICTs and applied to the task of growing minds in ways that improve the quality of learning for many, rather than few children. ICTs can give teachers access to great conceptualisers – inside and outside their own ranks – to assist them in planning and programming cognitive development. Best of all, the interactive capacity of ICTs provides more opportunities for students to engage as creators and manipulators in the learning process.

ICTs support us in bringing together aesthetic as well as scientific considerations, allowing us to overlay knowledge and meaning with skill and competence. We can, for example, enable students to design in ways that demonstrate perspectives difficult to create in classroom spaces, that reveal

new ways of seeing; we can bring serious research more easily into creative writing or we can incorporate story treatments into science using multi-media to enrich and stimulate better learning outcomes (Williams 1999).

Brain research now available to all teachers with an Internet connection enables us to stimulate specific brain s – and to be more targeted in our efforts to stimulate cognition in individual students.

We can, in short, use ICTs to qualitatively improve cognition by conceptualising more creatively, improving teachers' knowledge and by tailoring learning resources to meet the particular needs of a child at every stage of his or her education.

Pedagogies

It has been widely recognised that harnessing the power of modern technologies for learning purposes requires that appropriate learning strategies be developed that harmonise effectiveness in learning with the technology role. This recognition underpins the UfI/National Grid for Learning relationship, and a general interest in fostering innovation in learning strategies (Kearns & Papadopoulos 2000:77).

ICTs provide many opportunities to more easily use a variety of pedagogies. As a tool, ICTs can support didactic or facilitative approaches, collaboration and interaction across time and distance, enquiry or interrogation, open or closed research, lock step or mind-map. Online technologies support and make easier constructivist approaches, just as they make behaviourist approaches easier. The capacity of ICT to deliver information or to communicate with a mass of students in quite individual ways opens up the possibility of tailoring pedagogy to the needs of a student in time and place without the limitations imposed by peer groups. This provides the opportunity for software that utilises, for example, multiple intelligence theory.

While it is true that:

Information technology can only contribute substantially to the improvement of schooling if it is appropriately embedded in powerful and interactive learning environments [established within] the broader context of [supportive] pedagogy, curriculum and school organisation (DEETYA 1996:14), when it is so embedded, the improvement could be substantial. ICTs, for example, lend themselves very readily to holistic learning, collaborative grouping, problem-oriented activities and integrated thematic units. Teachers wishing to teach in this way will be both more efficient and effective if they employ ICTs to reach their goals. The ICTs of themselves will not improve pedagogy. They will, however, support and assist teachers who shift their pedagogies to be more student-d, project-based and collaborative. Scaffolding techniques are readily supported by ICTs. Systems, principals and teacher training institutions can use ICT to drive in these directions, using it to provide the scaffolding for the teacher as the teacher does for the student.

Convergence

We are experiencing convergence on many fronts (Wise 1999, 248), fuelled by information and communications technologies. Technologies themselves are converging. Medical technologies are converging with educational technologies (for example, the application of brain scanning to educational purposes, of chemical impact on the brain to behaviour modification) online technologies are converging with offline technologies (through, for example, the use of XML), digital technologies are interacting with media, with publishing industries, with entertainment, distribution and production industries. Such convergence has profound implications for the organisation, management and conception of education and educational delivery.

Further, as Dias and Atkinson (2001:8)) point out:

Research indicates that some of the most interesting and innovative uses of technology take place in classrooms where multiple uses of technology are implemented.

Inevitably, convergence is also occurring within the curriculum, across traditional subject areas, most of which were classified (and thereby conceptualised) in the eighteenth and nineteenth centuries. In the last thirty years new subjects have been added to curricula – subjects such as media studies, ecology, computing studies, creative writing, environmental studies. As useful as these subjects might be, the continual addition of areas of study to timetables and the already crowded curriculum will not serve as a useful model for the future. In the end, if we are to achieve quality outcomes for the students of the future, we must use ICTs to assist us to manage the convergence.

Responses to convergence

Multiskilling is one response. Knowledge management, using the organising capacity of digital technology is another. Alignment is another.

Multiskilling seeks to layer skills over knowledge areas, constructing a matrix that brings together, at the point of an educational outcome, both subject knowledge and discipline, with other skills or competencies (such as problem-solving, information technology skill, high level literacy skill or team skills). Multiskilling places high demands on teachers, who must themselves be multiskilled in order to manage the multiskilling demands of a curriculum. Information and communication technologies play a significant part in multiskilling because they provide enabling tools to speed processes and link knowledge.

Knowledge management brings search engines, thesauri, ‘see also’ and ‘see’ algorithms to link data-bases, texts, graphics, formulae and logic trees that by-pass the ‘silos’ of traditional subject thinking – assisting students in making connections across many areas of study and creating new domains of knowledge specifically for groups of students. Digital curriculum content can be built to capture some of this convergence. This is illustrated in the appended matrix for productions by the Sydney-based Open Training Education Network – Distance Education (OTEN-DE) of a prototype Physics Unit (Dobbs 2001).

Convergence is a significant opportunity and challenge for educators. We must meet the challenge and find ICT applications to assist us in managing convergence more effectively than we have in the past because the world itself is convergent as well as divergent; we need to educate for both.

Alignment

Alignment is an emerging concept in education facilitated by information and communication technology.

Schools can only be effective in enhancing teaching, learning and helping students achieve well-defined educational objectives when the standards, objectives, teaching, curriculum, resources, technology use and assess-ment are all aligned. The content and methods of assessment must be aligned to measure standards and objectives. Technology provides valuable tools to align the system to promote student learning by providing a means to monitor alignment and communicate these initiatives to the public (CEO Forum 2001:13).

This records the conscious application of a business model to education. Certainly, in the past we have sought consistency in education. We have allocated resources according to priorities and we have sought to have Maths teachers ensure, for example, spelling within their subject area rather than expecting a mother-tongue language teacher to ensure mathematics words are spelled properly. The emerging notion of alignment, however, does more than this. It does more because technology now provides the tools to enable us to more precisely align, and to measure the extent and quality of that alignment.

In a recent visit to the USA, the author observed the Oklahoma VISION project, initiated by the State of Oklahoma in partnership with Intel, Dell, Microsoft and a number of content providers. At the moment teachers in Oklahoma are restricted in what they teach by the available and approved textbooks. This project seeks to return responsibility and accountability to teachers for how learning is achieved. It also brings content producers into the accountability framework.

Western Heights, the initiating district, in Oklahoma, is looking for:

- disaggregated content that can be matched to specific topics in the curriculum;
- flexibility for teachers to choose what works for specific curriculum topics and groups of students;
- payment on the basis of what is used;
- the capacity to alter content use in response to test results;
- the capacity to change teaching methodology in response to test results;
- the capacity to link content use to a range of other data about students, teachers and the learning process in order to analyse data, diagnose need, restructure programs and redirect resources
- the capacity to allocate funding to the level of the teacher on a daily basis in response to diagnostic data.

In other words, Western Heights District Oklahoma is seeking the alignment of their curriculum, their documented outcomes, the content teachers use to achieve those outcomes, test results, methodology, student data, teacher professional development and finance. This amounts to a new business model for education and is only possible with the help of very sophisticated information management systems and electronically delivered content. In order to achieve this Vision, Oklahoma sought the assistance of a non-profit company, Jes & Co who specialise in matching interoperable, standards-based solutions to administrative and academic requirements for technology from schools. Jes & Co are developing a non-proprietary Learning Management System (Jes & Co 2001) that allows the free exchange of data between different education functions.

The Australian based Le@rning Federation (2001) initiative to develop a critical mass of high quality online curriculum content for Australian schools faces similar challenges to the Oklahoma project. At the moment our challenge is to align sufficient technology standards to allow us to exchange learning objects based online curriculum content between states and deliver to the school level in a way that protects intellectual property rights and allows teachers to construct their own learning sequences. A 'learning object' is a component of online material that can be identified, tracked, referenced, used and reused for a variety of learning purposes. For example, a learning object could be a single file such as an animation, a video clip, a discrete piece of text or URL or it could be a collection of contextual files that make up a complete learning sequence (Le@rning Federation 2001b). The learning object is likely to be larger than a digital object – it is a unit that has an educational purpose. Key to the Initiative is the expectation that, although the curriculum content is designed in sequenced units of work, teachers will unpack, re-sequence and combine components with other materials of their own. It is Lego-like content, designed to fit the culture of resource borrowing, creation and combination amongst Australian teachers. We are; however, acutely aware that quality does only reside in the learning object itself, but in its pedagogical surrounds and in the teacher's capacity to easily link content with outcomes, with assessment data and with student profile information. The quality of the alignment as well as that of the object and he delivery will determine effectiveness. At the school level, alignment has always been an issue. In the digital world, however, we can provide teachers with the tools to access and manipulate data, bringing effective alignment within reach.

Data

It is difficult to imagine a more potent lever for changing the priorities of schools than the evaluative methods we employ. What we count counts. What we measure matters. What we test, we teach….

The promise of new paradigms resides in their potential to provide methods and approaches that are both more equitable and closer to the values practitioners cherish Eisner (1998:109).

If we are to use ICT to better achieve the quality of educational outcome that we want; if we are to maximise cognition, skills development and improve our outcomes through alignment, we need to increase our respect for data. The debate about testing that has occupied education in the schooling sector in much of the English-speaking world for the last decade has obscured he importance of reliable, valid data to the improvement of educational outcomes and the increased effectiveness and professionalism that teachers can access by using ICTs to manipulate data, create intelligence and measure their effectiveness in sophisticated ways. Assessment Boards and accrediting agencies in Australia, for example, statistically moderate examination scores against teacher-based school assessments over many years. At a school level, with interfacing databases it would be possible over time to identify methodologies, motivational approaches, resources, activities, strategies that impact on outcomes. We don't have to rely on externally imposed tests in order to extract better value from data and evidence.

Joe Kitchens, the District Superintendent in Western Heights District in Oklahoma has been able to identify that a significant number of students failing in State maths tests demonstrated poor understanding of Set Theory[1]. Further examination revealed these students had mostly been taught in a similar way. By comparing this with the way successful students had been taught and retraining the teachers of the failing students, Western Heights was able to turn the results around.

Australian educators are encultured to be sceptical of the reliance of USA educators on test results and textbook delivery. However, the point remains very powerful. ICTs give us the efficiency to analyse performance data – however derived – to identify key points of success or problem (that is, to diagnose), to compare and to intervene. To fail to use the technology for this purpose is to choose ignorance over enlightenment.

To take advantage of this capacity of ICTs to assist us in evaluation we will need to develop a more research-oriented culture in teaching. Garvin's comments (2000:218) apply to teachers as well as principals and educational administrators:

> *All of us are flawed statisticians, who commit a wide range of interpretative errors. We have trouble separating signals from noise, do a poor job estimating probabilities, rely on misleading rules of thumb, and are over-certain of our own understanding and skills. To combat these errors and improve the accuracy and quality of learning, experts use a variety of techniques that could be easily adopted by managers. They keep running lists of their predictions to overcome hindsight biases. They solicit critical feedback to combat overconfidence. They review flawed choices to uncover hidden assumptions. They enlist the help of coaches and third-party observers to ensure that their words match their deeds. They compile extensive experience banks to enrich their repertoire of*

1. In conversation with the author, September 2001.

analogies and increase their skill at pattern recognition. They use *formal decision aids to calibrate their judgements and improve consistency. All of these techniques are designed to heighten awareness and develop a more refined understanding of how decisions are actually made.*

We need teachers who are attuned to data and its interpretation. We need systems that aggregate the right things and that make it easy for teachers to record their observations. We need more diagnostic specialists in education as well as more identification of teachers who are good conceptualisers and multi-media communicators. These are new specialists. ICTs open up much the same opportunities in education as medical technologies opened in the health industry over the last 50 years – and they will demand a similar set of specialisations. The other factor required to ensure the quality of education improves with ICT application is the training and quality of teachers and related professionals in the creation, use and interpretation of data and applications generated from use of those ICTs (Oliver 2001).

Education is an information and communications based industry and ICTs give us the 'grunt' to achieve better outcomes. As well as allowing us to communicate better with our students, and to provide them with more and better information, they give us better information about our craft and communicate finer-grained intelligence more quickly. We need to be prepared to respond.

I do not believe we will ever create the kind of algorithms that are useful in treating quantitatively rendered data, but we have learned that there is more than one way to parse reality, and, with more refined approaches for describing, interpreting, and appraising the educational words we care about, greater confidence in methods that elude the security of rule will, I believe, develop (Eisner 1998:108).

Culture

Finally, it is important to view our use of and assumptions about ICTs through a lens of culture. The Delores Report made a couple of predictions about online content and information technology use.

It seems that the differences will be chiefly between societies that will be capable of producing the content and those that will merely receive the information without taking a real part in the exchanges (Delores 1996:65).

There is no doubt but that individuals' ability to access and process information is set to become the determining factor in their integration not only into the working environment but also into their social and cultural environment (Delores 1996:172).

This paper began by stating that ICTs do not have to be used to educationally liberating, or even moral, ends. It is fitting it conclude with a further reminder of the obvious. ICTs do not have to privilege one culture over another. Educators almost universally use the book as a tool, adapting it to the needs of particular cultures. We need also to use ICTs universally in education, without adopting the economic and cultural assumptions that have driven its rapid globalization.

Quality and evaluation are culturally determined. The Delores Report and its reception has demonstrated that there are internationally shared values amongst educators. Quality in education, however, also depends on specific local application, on meeting the needs of specific individuals in specific social and cultural settings, respecting specific cultural values and communities. As we take up the use of ICTs in education we need to exercise care that we respect and make room for cultural values and differences. The standards that enable convergence and alignment and conceptualisation must also protect and nurture divergence. Quality is not served by hegemony or monoculture.

Applied with intelligence, diligence, research and commitment, ICTs provide powerful means of improving the quality of education along with significantly improved data for diagnosis and formative evaluation. This potential will be realised if educators in all sectors take up the challenge and hard work of adaptation and change required if we are to develop both ICTs in education and the profession in its use of them.

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