

Issues in the evaluation of information technology based educational programs

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Introduction

In recent years, there has been increasing attention to the use of computer based information technology in the delivery of educational programs. Access to the Internet has enabled schools, colleges and universities to draw on a range of programs, information and resources from around the world and to engage in a range of computer based interactive processes in their educational service provision.

In Australia, these developments have occurred in a context of shrinking government funding for universities. The Federal government has clearly signalled the need for universities to expand their sources of income and to reduce their traditionally heavy reliance on public funding. The use of computer based information technology in the delivery of educational programs has been seen as fitting well into this context for two main reasons. First, it may be regarded as enabling a less labour-intensive form of delivery than that of the traditional face-to-face teaching model. This is significant, given the very high percentage of university budgets commonly allocated to staffing. Secondly, the new technology is seen as enabling universities to extend their markets beyond those of local populations and publicly funded places. Consequently, the concepts of 'flexible delivery' and 'distributed learning' have been accorded high priority in many if not all Australian universities.

Australian schools have also largely embraced the new technologies. As Mann (1998) notes, 'over the last five years, (Australian education systems) have made a massive financial investment in information technology hardware, based on the premise that this will considerably enhance student learning'. Further incentive to move into this field has been generated by the perceived need to provide students with the information literacy competencies required for effective participation in an increasingly information-based society. As Lim (1998) notes, the integration of information technology into school education has been adopted by many countries as a key strategy to meet the challenges of the 21st century.

In contrast to the growing emphasis on the use of computer based information technology in the delivery of educational programs, the extent and scope of evaluation accompanying such development appear to have been relatively limited. Thus, for example, in the field of economic education, Agarwal and Day (1998) observe that 'the professional literature reveals almost no studies measuring the impact of using Internet technology on student learning and retention, perceptions of instructor effectiveness, and changes in attitude towards economics'. In like manner, Katz and Becker (1999) that in this field 'we do not have much information on the effect of the Internet on student outcome measures'.

This paper examines some of the factors that may help to explain the relatively limited attention currently being given to the evaluation of information technology based educational programs. In so doing, it seeks to identify a number of specific evaluation issues that warrant continuing attention.

Priorities for educators

The recency and speed of development of information technology based approaches have provided major challenges for staff in educational institutions. Educators have had to acquire new skills and understandings about the technology and to update these regularly in order to keep abreast of continuing change that characterises the field. Examination of the focus of computer use in schools illustrates this point. Surveys of computer use in economics and business education in United Kingdom schools, for example, reveal a change in emphasis from simulations and games in the mid 1980s to 'industry standard' generic wordprocessing, spreadsheet and database software in the early 1990s (Hurd, 1995), followed by increasing attention to interactive activities involving email and Web based materials in the mid 1990s.

As well as learning about the technology, educators have had to develop and extend their skills and understandings in relation to teaching and learning. In many ways the contexts of teaching and learning have changed with the developments in technology. This has required some re-thinking of teacher and learner roles and in turn some re-thinking of educative processes.

The net result for educators, particularly for those whose initial training preceded the computer revolution, has been a pressing and continuing need for professional development and training in both technological and pedagogical dimensions. Attempts to address this have been undertaken at a number of levels - system, institutional and individual. Some educational professional organisations have also moved to develop their own websites, establish web based information gateways (see, for example, Young, 1996), and provide regular articles and reports to their members on web based resources and teaching strategies.

Who carries responsibility for evaluation of educational program delivery? In most if not all schools and universities in Australia, prime responsibility for this is given to teaching staff, both individually and on an internal organisational level (such as a departmental or faculty level). Universities may also have an organisational unit focusing on teaching and learning across the institution that carries some program evaluation responsibilities. Most educational program delivery evaluation tends to be conducted internally, in accordance with the expectations or role specifications attached to the teaching process. This is also a resource issue, with internal evaluation being seen as a least cost option - an important consideration in resource stretched institutions.

Given the immediate focus on learning about the technology and associated pedagogy, and the priorities that this creates in the allocation of time and resources for educators, it is perhaps not surprising that evaluation appears to be receiving relatively limited attention. Lack of time is identified by ten Brummelhuis and Plomp (1993) as one of the four most important problems inhibiting the implementation of computer based education, along with lack of hardware, software and knowledge. In a similar vein, Gardner, Simmons and Simpson (1992) identify the availability of time for teachers to evaluate in a comprehensive manner and use their evaluation findings to modify programs and procedures as a major issue.

The complexity of information technology based educational programs

Traditionally, most teaching in schools and universities has tended to involve the offering of a fairly well controlled and common set of activities and content to a group of students within a classroom setting. Some variation has occurred to meet individual student needs within the group but in essence the intended curriculum has tended to focus on common and shared experiences.

The use of computer based information technology in the delivery of educational programs is providing a significant change to this paradigm. The nature of what can be now offered is such that students may create their own individualised programs as they work through a multiple pathway database or choose particular sequences of websites to carry out a specific task. This in turn may be accompanied by a variety of social and social-cognitive interactions within a class group with differential effects on individual student cognition (Nastasi, Clements and Battista, 1990).

The resultant variations in processes and outcomes carry implications for evaluation. As Eastmond (1991) notes, the new interactive technologies defy many of the linear and simplistic research designs so frequently employed in educational evaluation to date. The use of standardised instruments for programs operating across institutions may also need to be re-examined in light of the potential variation of program reality that the technology now provides.

Evaluation capabilities of educational institutions

As noted earlier, the prime responsibility for evaluation of educational programs in Australian schools and universities tends largely to be given internally to teaching staff. How well equipped are such staff to conduct evaluations? Universities may have a limited number of staff who specialise in evaluation in terms of teaching, research and consultancy. Schools in general would seem to be less well served. Current pre-service teacher education is generally expected to include some attention to curriculum evaluation. A limited number of teachers may have undertaken further postgraduate evaluation studies. A reasonable assumption at both university and school level would be that most teaching staff would have a general awareness of some key evaluation concepts and a working knowledge of a limited number of simple evaluation techniques that they apply to their programs.

As previously noted, the new interactive technologies suggest a need for relatively sophisticated evaluative procedures. The field of educational evaluation may well be able to provide these, given the significant advances in evaluation methodology, proliferation of new models, and the accompanying expansion of evaluation literature that has occurred in recent years. In tracing these developments, Greene and McClintock (1991) point to a number of themes. First, the focus and purposes of evaluation have expanded beyond the traditional emphasis on program goal attainment to aspects such as program logic, program development, program processes, and relationships among multiple program components. Secondly, there has been a recognition of the political nature of evaluation, involving a variety of stakeholders and values, with accompanying implications for decisions about evaluation design, implementation, interpretation and reporting. Thirdly, approaches to evaluation have broadened to encompass a widened range of philosophical principles and scientific methodologies.

Can teaching staff reasonably be expected to have or to acquire the range of knowledge and skills needed in order to make choices among the many alternative approaches and to design and implement evaluations suitable for the new interactive technologies? The complexity of issues in designing and conducting feasible and appropriate evaluations that will produce accurate and useful findings must raise concerns, particularly in education systems in which responsibility for evaluation is being devolved to local levels.

Some key issues

A number of evaluation issues emerge from the preceding discussion. These include -

- **Recognising the complexity of the field to be evaluated**

The use of computer based information technology in the delivery of educational programs may be seen as representing a major and fundamental shift in educational processes. It can involve significant changes in the roles and practices of the teacher and the learner. These may include, for example, learners working at various different times, with and without direct contact with teachers, learners following various different paths to complete set tasks, and teachers acting more as facilitators and co-ordinators of learning rather than as instructors. The educational program thus has the potential to become a series of individualised programs, with decisions about the individualisation process being made by the learner with or without the teacher's awareness.

Traditionally, much of educational evaluation has tended to focus on program intentions, processes and outcomes for specified groups of students working within and under the direct control and supervision of teachers. The processes have been those designed and overseen by the teacher and the outcomes examined have largely been those related to the program's pre-specified aims and objectives. The incorporation of computer based information technology provides the potential for much greater diversity in the content, processes, organisation, resources and outcomes in the individualised programs that can be experienced by students within a given group. For evaluation to provide valid and useful findings, the growing complexity of the educational experience needs to be recognised.

One particular aspect that is attracting attention in the literature is that of evaluating outcomes beyond those that are intended to be achieved within the particular program by the end of its implementation. It is suggested that the use of information technology approaches in a particular program may have effects for example on student attitudes towards computer technology in general, on student confidence and self-esteem, on participation and achievement in other programs, and on generic competencies and understandings. Lasting outcomes may well differ from immediate outcomes, particularly in the case of the first run of information technology based programs where there may be an immediate but short-lived novelty effect (Lim, 1998). Evaluations incorporating longitudinal, goal-free and cross-program dimensions would help to address these types of concerns.

Evaluation also needs to question the assumptions and rationale underpinning the information technology. Once decisions are made to spend significant amounts on computer hardware and software, there is the risk that this infrastructure may be regarded as a fixed aspect of the context within which evaluation takes place. To the extent that this occurs, the technology can then become the driving force behind curriculum decisions, rather than the educational needs of the students (Chizmar and Walbert, 1999). Any given technology will not necessarily be the most appropriate for the particular needs, interests and learning styles of particular students (Moore, 1999). There may well be differential effects across different age and social groups (Lim, 1998) as well as among individuals within any given group. The appropriateness of the technology needs to be subjected to evaluation as much as the processes, content and outcomes with which it is associated.

- **Developing evaluation capabilities**

Attention has been drawn above to possible shortfalls in the capability of educational institutions to conduct valid and useful evaluations of programs based on the new interactive technologies. This was particularly identified as an issue for schools in which the responsibility for program evaluation is devolved internally to teaching staff.

This situation carries major implications for teacher preservice and inservice education. Extended attention needs to be given to the broadening scope and methodology of evaluation that has emerged in recent years, as well as to the complexity of teaching/learning contexts and issues arising from interactive technologies. Schools need to be able to customise evaluation procedures and approaches to meet the particular needs and contexts that they face. The variations in student populations, instructional contexts and frequency of use of this technology across educational settings may mean that each institution will need to develop its own evaluation instruments (Petersen, Selfe and Wahlstrom, 1983).

Extending evaluation capability may also suggest a need for more partnerships in evaluation, with schools drawing on expertise from other schools, system authorities, professional associations and universities as a means of gaining the advantages of both internal and external sources. Societies such as the Australasian Evaluation Society, and their individual members, may well be able to act in partnership roles as well as contributing towards the inservice education of teachers mentioned above. Eastman (1991) suggests an additional form of external input in terms of cross-comparisons with similar programs conducted elsewhere.

- **According appropriate significance to evaluation within program development and implementation processes**

Recognising the complexity of the field to be evaluated and developing evaluation capabilities are necessary but insufficient steps in seeking to develop the extent and scope of evaluation being conducted. A higher priority needs to be attached to evaluation at both individual and organisational levels in order to achieve the potential benefits offered by extended understandings and capabilities. Conversely, if a higher priority is not accorded, there may be little incentive to address the understanding and capability factors.

Higher priority tends to translate into higher costs. Focusing on specific contexts and individualised evaluations, in the light of greater understanding of the complexity of the field, leads to costs of what are essentially non-standardised procedures (Eastmond, 1991). The development of evaluation capabilities in itself incurs additional costs. Opportunity costs also need to be considered for each of the above. Cost considerations in turn lead to questions of affordability and feasibility that may encourage restrictions on the extent of evaluations being conducted or recourse to more standardised or traditional approaches and procedures.

The consideration of costs needs to be balanced by a consideration of benefits, both short term and long term. The incorporation of systematic cost-benefit analysis may require a change in mind-set in some educational institutions. 'We (educational institutions) rarely systematically identify, measure, estimate and predict costs, benefits, cost-effectiveness ratios, benefit:cost ratios and productivity.' (TLTSN Centre, University of Glasgow, 1996). The nature of educational costs and benefits may make it difficult to assign monetary values. It may be more appropriate to assess these 'in terms closer to their experience' or to estimate them on say a five point scale (TLTSN Centre, University of Glasgow, 1996).

Commitment to extended evaluation rests upon deeper understanding of its role and potential importance. This again would seem to signal the need for extended teacher preservice and inservice education, supported by a particular emphasis on

developing understanding among those in leadership roles in educational institutions. Evaluation societies could play an important role in this process as part of their broader charter of promoting the field of evaluation.

Conclusion

It has been contended in this paper that the relatively limited attention currently being given to the evaluation of information technology based educational programs may be related to three main factors - an over-riding priority given to the technological and pedagogical dimensions of program development and delivery, the complexity of information technology based educational programs, and shortfalls in the evaluation capabilities of a number of educational institutions. These in turn have been used to identify a range of issues to be addressed in order to develop the extent and nature of evaluation currently being conducted. The addressing of these issues essentially involves processes to deepen understanding and skill levels and to encourage the assignment of a high priority to evaluation in educational institutions. Without such measures, the nature and extent of evaluation will continue to fall short of what it could be, thereby ensuring that the worth of the use of computer based information technology in the delivery of educational programs will, in many cases, remain more a matter of conjecture than of soundly informed determination.

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