

Teaching About IT: Standards in Pre-Service Teacher Education

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Introduction

Every year thousands of people graduate with a qualification that licences them to be employed as a teacher. This paper will focus on a small sub-set of those graduates – prospective teachers of Information Technology (IT) in secondary schools. IT is just one among many subject areas offered in most systems of secondary education. Because the subject is relatively new and therefore has no historical context or tradition, there is little precedent or advice to guide in the preparation of new IT teachers.

Recent reports in the UK and the USA note that school age children and adolescents are making increasing use of computers and information and communication technology (ICT) at home and at school, for both recreational and educational purposes (Hayward, Alty, Pearson and Martin 2002). Australians entering a pre-service secondary teacher education course do so after at least 7 years of primary schooling, 6 years of secondary schooling, and 3 years of undergraduate university study. In 2005 it would therefore seem reasonable to expect that these soon-to-be teachers would be frequent and competent users of a range of ICTs and other technologies. The changing nature of core (compulsory) educational technology subjects within teacher education courses appears to indicate that students have an acceptable level of ICT knowledge and skills. However there are still many un-answered questions that arise as each new cohort of new teachers begins their pre-service teacher education. Exactly what are the ICT related attitudes and competencies of these people, and more importantly, how will these personal attitudes and competencies influence the frequency and method of classroom ICT use when the teachers enter the educational workforce?

In Victoria, government policy and teaching IT have crossed paths for many years. In 1980 a report to the Education Department stated, It is recommended that, once adequately prepared teachers are available, each school own a micro-

computer or interaction terminal facility (McDougall 1980, 32). This high value placed on teacher preparation and professional development was reflected in subsequent state government policies and actions. At around the same time as this report appeared, an IT subject was approved for the final year of secondary school. In 1984 Monash University introduced a mandatory IT in education subject as part of the secondary teacher accreditation course. A survey of pre-service teacher education courses in university handbooks of the period suggests that this was the first such mandatory IT specific course for prospective teachers. This development occurred more than a decade before the Victorian Government notified teacher education institutions in 1997 that it was preparing to employ only graduating teachers who had successfully completed a subject that ensured capability in basic IT skills, knowledge, and classroom applications.

The latest versions of Australian secondary school curricula suggest, or in some states mandate, that various applications of digital technology be used in all subject areas and at all levels. While there are the necessary provisos concerning relevance and appropriateness, there can be no doubting the intention of the curriculum designers, and by extension of the education systems. To various degrees state governments support teacher professional development in classroom uses of digital technology, and the acquisition of hardware and software by schools. However these all relate to current teachers, schools and curricula. The major issue considered in this paper is how potential leaders in educational applications of digital technologies enter teaching and are prepared for their future role.

Most teachers in Australian schools do not have personal experience of learning with computers as a student. Consequently they have no ICT experiences of their own to draw on when they have to teach with technology. This is one significant reason why preparing teachers for teaching

with and *about* digital technologies is conceptually different from teacher preparation in all other areas. In addition, schools today provide a number of physically and psychologically different spaces in which ICT is taught *with* and *about*. As well as normal classrooms that do not have computers, ICT is taught in computer labs (for a whole class) or pods for part of a class). Typically the latter spaces do not have room for students to work away from computers. There appears to be little published research that has explored the pedagogical practices used by ICT teachers in these different settings.

To simplify the discussion, information and communications technology or ICT, will be used here to mean any of the computer and information and communication technologies subjects taught *with*, *through* or *about* computers in schools. While this will aid simplicity and consistency, it is acknowledged there are differences in meaning between the two terms. Thus ICT, will be taken to relate to classroom applications using the hardware and software of digital technologies for teaching and learning. Included in ICT will be the now mundane uses of word processing for stories, essays and assignments, spreadsheets for presenting and calculating in social studies, health, science as well as mathematics, and for many uses of multimedia across the curriculum. In contrast, IT will be taken to represent the subject discipline of information technology as a focus of study. In 2005 every classroom teacher should be a user of ICT. In addition, some teachers will specialise in teaching about information technology.

The basic argument proposed in this paper is that future leaders in educational ICT and IT are not yet in schools and teaching. In particular, many future leaders in educational ICT and IT for secondary education will come from new entrants to the teaching profession who bring with them qualifications and industrial experience in IT.

Impediments to IT teacher education

In the first decade of the twenty-first century, after more than twenty years of exploring computer use in schools, many teachers, parents and administrators are questioning some of the claims of educational benefits resulting from classroom applications of digital technology. For some, educational technology has been seen as an agent of social and school reform, for others as a way of providing equity of access and benefit to all students, and for others as a means of up-dating classroom practice by changing the processes of learning and teaching. So far all three groups have been largely disappointed. There have been numerous reports of limited examples of exemplary use of ICT to assist learners and teachers, but none that indicate permanent changes to existing school and classroom practices.

Hodas (1993) has argued that because education systems are first and foremost organisations, they always work towards their own continuance, and this might be in conflict with the purposes of innovations. He notes that introducing new technologies, such as ICT, is not without a hidden agenda. [T]echnologies are neither value-free nor constituted simply by machines or processes. ... [T]hey are the uses of machines in support of highly normative, value-laden institutional and social systems (Hodas 1993, 11). It is argued by Hodas that those seeking to bring about change through the introduction of technology deliver contradictory messages. Policy makers and the public are likely to be told of the potential of technology to reform education, while at the same time teachers are assured that the technology will assist them to carry out their current tasks more effectively. In other words, one group is acquainted with of the potential for change, while the other group is led to believe their roles and practices will not change.

So far unmet expectations about classroom use of digital technology, together with the difficulty of change in organisations such as schools and education systems, have been proposed as factors impeding effective teacher education in education applications of ICT. Watson (2001) summarises this when she states that

IT is not only perceived as a catalyst for change, but also change in teaching style, change in learning approaches, and change in access to information. Yet research indicates that teachers are both threatened by change, and conversely not impressed by change that appears to focus on what the technology can do rather than on learning. (Watson 2001, 252)

At the end of this comment Watson introduces the most significant factor in determining the effectiveness, or otherwise, of ICT education for teachers. As was the case in schools in the 1980s, most of the effort put into ICT in teacher education has focused on student teachers becoming proficient with the technology. For several reasons, including insufficient time allocated for ICT education and a lack of relevant classroom experience among education faculty staff, student teachers have developed skills and proficiencies in technical aspects of using computer hardware and software, but have had little or no tuition in how ICT can be used to improve teaching and learning.

Preparing future leaders for IT education appears to be something that is not given serious consideration by schools and systems. The historic practice of promotion being based on seniority has led to leaders being sought from the most experienced teachers rather than from the most innovative. As noted by Hodas (1993), one consequence of this approach is the difficulty in changing ideas, pedagogies and practices in education systems.

When developing pre-service teacher education courses there are major issues about whether the emphasis should be on innovation and change in education, or on current practices of the majority of teachers. Should new teachers be expected to operate in the existing reality of school and classroom practice, or should they be prepared in order to bring about change by introducing new ideas and different methodology? A few years ago it might have been argued that just providing new teachers with ICT skills was going to bring about changes in the processes of teaching and learning. Currently, half way through the first decade of the 21st century, the issue has become one of how much should teacher preparation courses make new teachers ready to apply software and hardware that is not yet being used in schools?

Standards for IT teachers

An examination of stated criteria and standards for the accreditation of secondary school IT teachers suggests there is an over-emphasis on the development, measurement and assessment of technical skills, to the detriment of knowledge and understanding of issues in the affective and cognitive domains. The curriculum document that will apply from 2006 in the Australian state of Victoria places ICT as something that all teachers and students will use across the curriculum. One consequence of this is that IT is only taught as a subject in the final years of secondary schooling. Currently most secondary schools offer a variety of IT subjects, both core and elective, in the first four years of secondary education. It is unclear whether this new curriculum structure will have serious ramifications for current and prospective IT teachers.

For many teachers, the curriculum documents they are given are also unhelpful and uninformative in clearly informing them

what should be taught and what students need to learn. For example, in the standard 'ICT for visual thinking' for years 9 and 10 it is stated: Students use a range of ICT tools and data types to visualise their thinking strategies when solving problems, and discriminate between such tools and strategies based on their suitability for problem solving in new situations (VCAA 2005, 82). Statements such as this provide almost no assistance to either beginning or experienced teachers.

Minaidi and Hlapanis (2005) discuss pedagogical obstacles, described as epistemological barriers that are internal to the learning process, in the context teachers learning to use ICT in the classroom. It is claimed that pedagogical obstacles hinder teachers' attempts to familiarise themselves with the use of ICT and to apply technology in their classrooms (Minaidi and Hlapanis 2005, 242). Because new knowledge builds on existing knowledge, there is often conflict between what existed before and the new knowledge. When existing knowledge has been accepted and used for a considerable period of time, it can be difficult to replace it with new knowledge. It follows then that an epistemological obstacle might be the result of existing knowledge being stronger or more acceptable than some new knowledge. Two primary barriers when training teachers to use ICT are related to primary experiences and verbal expression (Minaidi and Hlapanis 2005, 244).

A cohort of 30 students enrolled in a one year pre-service Graduate Diploma in Education and training to become secondary IT teachers, completed a survey about their qualifications. At the time the University was communicating with the Australian Computer Society (ACS) about the professional standing of IT teachers. Admission requirements for the ACS include applicants demonstrating that they possess the Core Body of Knowledge, which involves:

- having acquired an appropriate combination of recognised educational qualifications,
- having acquired practical experience in Information Technology, and
- having been actively engaged in Information Technology (or having obtained a recognised qualification in Information Technology) within the 6 months immediately prior to the date of application.

A summary of the academic qualifications of this group is given in Table 1.

Table 1. Academic qualifications in IT.

In addition to considering the time spent studying IT, the society has three topics it regards as core or compulsory. When the teacher education students indicated the place of these core topics in their IT courses, a surprisingly high percentage had not studied them. See table 2 below.

Table 2. Selected topics studied in IT qualification

The data in these two tables indicates that this group of pre-service teachers is well qualified in IT, even if half of them do not meet all the requirements for admission into the Australian Computer Society. However it is not IT content knowledge that the cohort saw as a major issue in becoming a teacher. During debriefing discussions following each of the three school placements, classroom management and control, even in computer labs, were ranked as the most pressing issues.

Knowing how to effectively teach the content of IT subjects was not considered important and did not rank in the top three issues. Despite these perceptions of the pre-service teachers, an examination of comments written by supervising teachers on lesson plans, and the formal report on the placement, suggest

otherwise. There were many comments from supervisors about content and language in lessons being at inappropriate levels, and indications that a transmission mode of teaching predominated. There were, on the other hand, relatively few negative comments about classroom management and organisation. When some of the supervisor comments about pedagogy were raised, the pre-service teachers appeared to believe that if they knew the content and could maintain student control, then the strategies used for teaching were not important.

Hammond (2004) notes that pre-service teachers he interviewed saw ICT as a practical subject that occupied students in hands-on activities that involved skills with a vocational orientation. They noted that this practicality made ICT intrinsically motivating to students, although this was conditional on the teacher and the activity. When teaching, these teachers aimed to provide a mix of whole-class teaching and hands-on activity and a further mix of teacher direction and pupil exploration. This balanced approach enabled them to explain why some approaches were unacceptable (Hammond 2004, 39). The pre-service teachers who participated in the Australian study showed no evidence of being able to do this.

Concluding comments

For a variety of reasons, whose causes are not fully understood, classroom teachers in subjects other than IT are not making effective use of the learning technologies currently available in schools. This is true in both primary and secondary schools, and raises many issues, including concerns about the cost-effectiveness of the large investment in hardware and software, and what professional development is necessary for teachers. In this paper one aspect of the latter issue has been examined.

Logic suggests that new entrants into pre-service teacher education will have had experiences with ICT during their schooling and their university studies. The quality and scope of those experiences will differ greatly, but it does mean that there will be teachers entering the profession who have been aware of, and have used, ICT for educational purposes for at least a decade and a half.

Although the focus has been on pre-service teacher education, similar concepts and approaches can be applied to professional development for current teachers. Of course school and system administrators have to be aware that no matter how high the level of competence and confidence of teachers, ICT will never be integrated into normal classroom practice until the technology is available and accessible where teachers teach. We are misusing resources and have a long way to go while-ever teachers have to make bookings weeks ahead, then find and connect together video-projectors, computers, and software prior to teaching a lesson.

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