

Changing patterns of preservice teachers' ICT competencies and what it means for preservice teacher education programs

Author

Watson, Glenice, Prestridge, Sarah

Published

2001

Conference Title

Australian Association for Research in Education International Education Research Conference

Rights statement

© The Author(s) 2001. For information about this conference please refer to the publisher's website or contact the authors.

Downloaded from

<http://hdl.handle.net/10072/1391>

Link to published version

<https://www.aare.edu.au/>

Griffith Research Online

<https://research-repository.griffith.edu.au>

Changing patterns of preservice teachers' ICT competencies and what it means for preservice teacher education programs.

Paper presented at the AARE Conference Fremantle, 2-6 December 2001

by

Dr Glenice Watson and Ms Sarah Prestridge

School of Curriculum, Teaching and Learning

Griffith University

Nathan, Q 4111

G.A.Watson@mailbox.gu.edu.au

Abstract: Preservice teacher education programs are under pressure from employing authorities to prepare teachers to be confident and competent users of information and communication technologies (ICTs) in their classrooms. It is no longer sufficient (if it ever was) for teachers to leave tertiary institutions with basic ICT competence and depend on employing authorities to provide the necessary professional development to turn those competencies into meaningful ICT classroom practices. Frequently employers are looking to recent graduates to provide ICT leadership and exemplary innovative ICT practice. The rapidly changing nature of ICT and the enormous divergence between the ICT competency base of entry students poses a considerable challenge to academics responsible for the development of the ICT components of preservice teacher education programs. The research that forms the basis of this paper involves a longitudinal study of the changing nature of preservice teachers' entry ICT competencies and attitudes. These data are used to inform practical outcomes for the ICT components of the teacher preservice program that better meet the demands of employing authorities, the rapidly changing nature of ICT in learning, and the diverse ICT competency base of entry students.

1. Introduction

Integrating ICT into school educational practice prepares all young people to participate in and contribute to an information society that requires high levels of literacy, numeracy, technological competence and a spirit of creativity and enterprise.

(Australian National Training Authority, 2000, p.17).

A critical reading of the above statement would invite many questions, not the least of which would be: 'what do we mean by an information society?'; 'who benefits, who loses from an information society?'; and 'how does integrating ICT into school practice prepare young people for an information society?'. This is before we start on the questions of how we might go about integrating ICT into school practice and its corollary of how we prepare teachers to be able to do this. While the first three are fascinating questions that should be included in all teacher preservice programs, there is no doubt that teacher employment authorities are much more firmly focussed on

graduates who know **how** to integrate ICT into school practice rather than ones who could mount a well informed debate on the questions posed.

Recent policy documents such as *Learning for the Knowledge Society* (Australian National Training Authority, 2000), *New Basics Project* (Education Queensland, 2000a) and *Literate Futures* (Education Queensland, 2000b) redefine education in new ways. These documents require teachers to use Information and Communication Technologies (ICTs) in their students' learning in meaningful ways that ensure 'multiliterate' outcomes. For example the *New Basics Project* breaks down the boundaries of traditional discipline areas as represented in the Key Learning Areas and provides a more integrated way of thinking about education under the 'new basics' of:

- Life pathways and social futures
- Multiliteracies and communication media
- Active citizenship
- Environments and technologies (pp.43-50)

It requires teachers to adjust their teaching programs around the concept of 'rich tasks' (pp.51-54) and employs the concept of 'multiliteracies' (The New London Group,1996) as being appropriate for a networked society that requires the use and blending of various kinds of literacy simultaneously, the mastery of many different codes, and the capacity to switch between and blend these various 'multiliteracies'(p.45). *Literate Futures* redefines 'literacy' in broad, future-oriented terms as:

Literacy is the flexible and sustainable mastery of a repertoire of practices with the texts of traditional and new communications technologies via spoken language, print, and multimedia (p.3).

This requires teachers to maintain their commitment to traditional standards of mastery with reading and writing while blending these with standards of mastery of new technologies, new literacies and new ways of expression and interpretation (p.5). *Learning for the Knowledge Society* charges all educational stakeholders to:

develop strategies and implement key initiatives to ensure that all citizens possess broad literacy, numeracy and technological literacy skills for life, work, and lifelong learning and that there are adequate numbers of people with the specialist skills needed by the information and communications technology (ICT) industries (p.10).

The provision of professional development for preservice and inservice teachers is seen as one of the 'critical success factors'(p.16) in achieving its aims and under its 'Action area 1:People' it seeks to "determine how effectively both initial and ongoing professional development courses are preparing education and training workers (especially teachers) for the information economy and develop program responses where appropriate" (p.42).

In March 2000, the Ministers for Education, Employment, Training and Youth Affairs (www.detya.gov.au/archive/ministers/kemp) made a *Joint statement on education and training in the information economy* that states: "In the information economy, quality education and training is fundamental to the well-being of individuals communities and schools". It names all sectors of education as having key roles to play "in contributing to Australia's development as an equitable, imaginative and economically strong knowledge society". ICT is seen as having a key role in this education and training: "Information and communications technologies (ICT) offer the sector a vast array of opportunities to deliver its services better, more accessibly and more cost-effectively, while taking full advantage of the benefits of networked learning communities". The Ministers agreed to a number of areas for co-operation that were to have the highest priorities during 2001-2003. Three of these are particularly relevant to preservice teacher ICT programs:

- Ensuring that the education and training sector is able to provide all learners with opportunities to develop their ability to use technology confidently and creatively, and to develop the specialist skills needed to service the needs of the information economy.
- Supporting education and training workers, especially teachers, to acquire and maintain the skills needed to take full advantage of the potential of ICT to transform learning.
- Sharing leading practice and research on ICT issues.

From the above documents it can be seen that much is being required of teachers and their preservice and inservice ICT professional development programs. However there is scant information (see for example Ropp, 1999; Schrum, 1999; Strudler & Wetzel, 1999 and Yelland & Bigum, 1995) on effective ways of developing such programs so that they lead to transformative classroom practices. Furthermore the rapidly changing nature of ICT and the ICT competency bases of incoming teacher education students requires such programs to be constantly under review. This paper explores data collected from incoming teacher education students on two campuses of Griffith University over the years of 1999 and 2001 and considers what it means for the structure of ICT preservice professional development within teacher education programs.

2. Data exploration

The data explored in the following section were collected by survey administered to incoming first year students in a Bachelor of Education program for intending primary teachers. The survey had four sections: demographics, attitude, skills and previous experience. The same survey (with a minor change in one skill) was administered in 1999 (N=296) and 2001 (N=305) across the Mt Gravatt and Logan campuses of Griffith University in Queensland, Australia. The Mt Gravatt campus is an established campus that was formerly a College of Teacher Education and is located in an inner southside suburb of Brisbane while the Logan campus is a new campus of Griffith University located in Logan City to the immediate south of Brisbane. The Bachelor of Education program enjoys a good reputation and attracts students of high academic calibre. The students were about to embark on a core first year subject called *Learning with Information Technology* and the survey was administered in the first lecture period for this subject.

2.1 Demographics

The basic demographics of the surveyed population are shown in Table 1. As the survey was administered in the first week of the semester when enrolment figures are somewhat unstable it is difficult to know exactly what percentage of the total Bachelor of Education population was covered by the survey, but it was at least greater than 95%.

	Logan 1999	Logan 2001	Mt Gravatt 1999	Mt Gravatt 2001	Total 1999	Total 2001
Number	77	120	219	185	296	305
% males	9.09	18.33	13.70	15.68	12.5	17.7
% females	90.91	81.67	86.30	84.32	87.5	83.3

Table 1. Basic demographics of the population

The most obvious feature of Table 1 is the hugely disproportionate number of females (87.5% in 1999 and 83.3% in 2001) in the population. This is in keeping with the general statistics on the preponderance of females in teacher education programs and within the profession itself where approximately 75% of all teachers are women (AAUW, 2000, p.ix). However during the period of the study there has been a 5.2% increase in the number of males on the total population and a particularly noticeable increase on the Logan campus where the percentage rose from 9.09 to 18.33. It could be speculated that recent wage rises in the profession and a more positive media image for teachers have contributed to this increase. However as most of the increase in the male population has been on the Logan campus which is generally considered to draw its population from a less affluent socioeconomic clientele then it is also possible that the downturn in the economy and the increasing scarcity of positions in non-teaching employment market may have contributed to this increase.

Table 2 shows the age distribution of the population. Not unexpectedly the under-21s comprise the majority of the population on both campuses and in both years, and becoming slightly more populous in 2001. There was also a slight increase in the greater-than-39 population with concomitant decreases in the other two age groups.

Age	Logan 1999 (%)	Logan 2001 (%)	Mt Gravatt 1999 (%)	Mt Gravatt 2001 (%)	Total 1999 (%)	Total 2001 (%)
<21	58.44	60.83	57.99	63.24	58.11	62.30

21-29	19.48	18.33	22.83	18.38	21.96	18.36
30-39	22.08	14.17	13.70	11.35	15.88	12.46
>39	0	6.67	5.5	7.03	4.05	6.88

Table 2. Age distribution of the population

Family attended uni	1999 (%)	2001 (%)
0	52.36	44.74
1 to 3	42.23	45.72
More than 3	5.41	9.54

Table 3. Number of student's immediately family who had attended university

The students were asked to indicate the number of their immediate family who had attended university. This data is shown in Table 3. It is remarkable that in 1999, 52.36% of the cross-campus population were the first in their immediate family to attend university. Even more remarkable is that on the Logan campus 70.13% (not shown in the table) of students were in this category. However there has been considerable change in this figure over the two years of the study with the 2001 data showing 49.23% of the Logan population with no family university attendees. Over the same period there was less than a 3% decrease for the Mt Gravatt population.

2.2 Attitude

Ropp (1999, p.403) says: "Attitudes matter. If preservice or inservice teachers demonstrate proficiency integrating technology into their teaching but do not believe that technology has a use in the classroom, they will probably not teach with technology despite their proficiency". In the survey under discussion, the students were asked to rate their attitudes with respect to computers on a scale of 1 to 5, where 1 indicated 'strong disagreement' with the statement and 5 indicated 'strong agreement'. If all students strongly disagreed then the result would be 1 and if all strongly agreed then the result would be 5. In the following commentary, statistics expressed as 3.74/3.59 are meant as a comparison of the statistic under discussion. For example in the following statement about enthusiasm for using computers the statistic compares the two years under study, but later comparisons might be gender, age or campus.

Attitude by year	1999	2001
-------------------------	-------------	-------------

I am enthusiastic about using computers	3.74	3.59
I think computers are an important part of teaching	4.11	4.02
I want to learn more about computers	4.26	4.10
I feel anxious when I use a computer	2.62	2.52
I feel quite confident when I use a computer	3.27	3.21
I expect to learn everything there is to know about computers in this subject	3.16	2.70

Table 4. Attitudes with respect to computers: cross-campus by year

(1 = ‘strongly disagreed’: 5 = ‘strongly agreed’)

The three statements ‘I am enthusiastic about using computer’ (3.74/3.59), ‘I think computers are an important part of teaching’ (4.11/4.02) and ‘I want to learn more about computers’ (4.26/4.10) all received quite positive responses in both years under study, but perhaps surprisingly there was a slight decrease in positivism over the two year period. As the subject the students were about to embark upon was called *Learning with Information Technology* and the population was first year students in their first lecture it could be assumed that there may be a certain element of these statistics that derived from the students’ desire to show the lecturer that they knew what the ‘right’ answer should be! However unless we assume the 2001 population was less inclined to impress the lecturer than the 1999 population – increasing ‘sophistication’ perhaps – this explanation does not explain the decrease in positive attitudes over time. One possible explanation relates to the increasing exposure to computers at school (see Table 9). If this experience has been less than positive for the students then it would not be surprising if their enthusiasm for using computers in teaching has declined. Another possible explanation is that with the increasing immersion of computers into the students’ everyday life, computers have lost their ‘gee-whiz’ factor and have become something to be assumed rather than something to exclaim positively over.

The two statements about how students feel when they use computers namely ‘I feel anxious when I use a computer’ (2.62/2.52) and ‘I feel confident when I use a computer’ (3.27/3.21) were intended to be ‘check’ questions in that it would be expected that students who disagreed about feeling anxious would agree with feeling confident or express neutral (3) to both. They were not placed sequentially on the questionnaire in some minimal attempt to camouflage their ‘check’ intention. Given that if all students expressed a neutral response then the score would be 3, the slight negative expression of anxiety and the slight positive expression of confidence would appear valid. Worth noting is the large percentage of students (21.96% in 1999 and 21.31% in 2001) who expressed either agreement or strong agreement with feelings of anxiety, and there has been very little change in that figure over time. Similarly there has been little change in the percentage of students (41.55% in 1999 and 40.98% in 2001) who express either agreement or strong agreement to confidence with computers. What has changed markedly is the campus distribution of these figures with Logan moving from 40.25% in 1999 to 53.33% in 2001 with Mt Gravatt experiencing a proportional decline. This is consistent with the skills by campus figures shown in Figure 2.

The final statement in the attitude section was "I expect to learn everything there is to know about computers in this subject". The response to this question is rather revealing. In 1999 the response rate was 3.16. This means that a very large number of students agreed or strongly agreed with this statement. This statement has been included in the questionnaire as somewhat of a nonsense statement to draw the student's attention to the impossibility of learning 'everything' about computers in a one-semester subject (or ever for that matter) and to remind them of the on-going nature of learning about information technology. It does reveal however how little many students understand about the real power of computers.

Attitude by gender (2001)	Male	Female
I am enthusiastic about using computers	3.88	3.55
I think computers are an important part of teaching	3.90	4.04
I want to learn more about computers	3.88	4.14
I feel anxious when I use a computer	2.53	2.52
I feel quite confident when I use a computer	3.37	3.18
I expect to learn everything there is to know about computers in this subject	2.76	2.69

Table 5. Attitudes with respect to computers: cross-campus by gender (2001)

Males and females are generally considered to have different attitudes to using technology (see for example Penley, 1991; Turkle, 1984 and Wood, 1994) and 'woman as technophobic' and 'man as technophilic' is a well-recognised dichotomy in the discourse of Western industrialised countries (Stabile, 1994, p.1). Gill and Grint (1995, p.3) go so far as to say that: "The cultural association between masculinity and technology in Western societies is hard to exaggerate". Table 5 shows the gender differences in the cross-campus population for 2001. In keeping with the literature, males express more enthusiasm for using computers (3.88/3.55) and express greater confidence when using a computer (3.37/3.18). However as Clarke and Chambers (1989) and Teague et al., (1996) point out males tend to have a misplaced confidence in their ability with computers while females' less confident attitude may be a more accurate representation of their ability in the area. Given the rhetoric of male affinity with technology, there is surprisingly little difference (2.53/2.52) in males to females anxiety scores. In contrast to males greater degree of enthusiasm for computers, females are more likely to think that computers are an important part of teaching (4.04/3.90) and want to learn more about them (4.14/3.88).

Attitude by age (2001)	<21	21-29	30-39	>39
I am enthusiastic about using computers	3.53	3.81	3.76	3.19
I think computers are an important part of teaching	3.94	4.19	4.30	3.81

I want to learn more about computers	3.92	4.16	4.65	4.52
I feel anxious when I use a computer	2.23	3.00	2.86	3.33
I feel quite confident when I use a computer	3.45	3.14	2.68	2.24
I expect to learn everything there is to know about computers in this subject	2.65	3.07	2.72	2.19

Table 6. Attitudes with respect to computers: cross-campus by age group (2001)

Age differences in attitudes with respect to computers are shown in Table 6. This shows that the 21-29 age group is more enthusiastic about using computers while the 30-39 age group is more likely to think computers are an important part of teaching and want to learn more about them. The over-39 age group is more likely to feel anxious about using computers while the under-21 age group is more confident.

Attitude by campus (2001)	Logan	MtGravatt
I am enthusiastic about using computers	3.74	3.45
I think computers are an important part of teaching	4.14	3.95
I want to learn more about computers	4.04	4.13
I feel anxious when I use a computer	2.33	2.64
I feel quite confident when I use a computer	3.51	3.02
I expect to learn everything there is to know about computers in this subject	3.05	2.48

Table 7. Attitudes with respect to computers: 2001 by campus

There are slight campus differences in attitude with respect to computers as shown in Table 7 with Logan students being more enthusiastic about computers, think them important in teaching and want to learn more about them. Logan students are also less anxious and more confident when using a computer but also more likely to expect to learn 'everything' about computers in the subject under study.

2.3 Skills

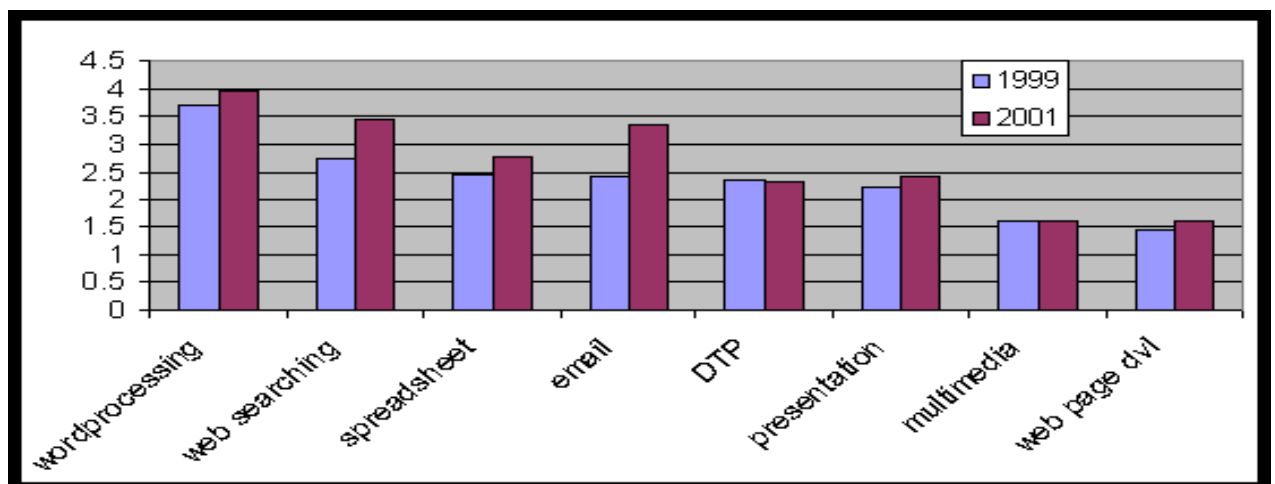
Recently, the Commonwealth Department of Education, Training and Youth Affairs funded a project carried out by the Australian Key Centre for Cultural and Media Policy at Griffith University and published under the title of *Real Time: Computers, change and schooling* (Meredith et al., 1999). This project included an extensive audit of teacher ICT skills and attitudes. Teachers were required to self evaluate their ICT skills in basic (such as turning on a computer, quitting programs, saving a document and deleting files) and advanced (such as using virus software, creating music and sound, creating multimedia, and using the World Wide Web) categories. It found that over 95% of teachers in the sample possessed the basic range of skills required to use computers (p.334) and the majority have more than half the advanced skills. The report notes that the data provide some evidence of transformation in teaching practice in that many teachers have begun to use ICT with their classes within the past

five or six years (p.334). However it also agrees with other education literature that suggests that:

While many teachers have developed basic information technology skills, they may not be extending them in ways that are likely to fundamentally change the ways they teach, or in ways that will enable the use of computers as other than relatively low-level educational tools (p.336).

Ropp (1999, p.404) says: "if teachers are to integrate technology into their teaching, they must feel efficacious about using it". In the survey under discussion, the students were asked to self evaluate their skills in a range of computer applications from 1 to 5 where 1 indicated 'no competence' and 5 indicated 'very competent'. If all students rated themselves as 'no competence' for a particular skill then the score would be 1, and if all students rated themselves as 'very competent' the score would be 5. Skills were listed by generic title, for example 'wordprocessing' with an example of software, for example *Microsoft Word*, beside it. The same set of skills was provided in both years with the exception that 'databases' were included in 1999 and 'graphics' in 2001 because slight changes to the course had resulted in 'databases' being dropped from the 2001 course while 'graphics' were given more emphasis. Figure 1 shows the cross-campus scores for the range of skills that were included in both years.

Figure 1. Cross-campus self-evaluation scores for computer skills by year



(1 = 'no competence': 5 = 'very competent')

Students evaluated themselves as having the greatest competence in 'wordprocessing' and the least competence in 'multimedia' and 'web page development'. However scores in all skills other than wordprocessing were below 3 (which would be a mid-point competence) in 1999. Not unexpectedly there has been an improvement in self-evaluated competence between 1999 and 2001 in many of the skills with particularly large increases in 'web searching' and 'emailing'. This probably reflects the enormous growth in private Internet connections over the period. However 'desk top

publishing' has declined, 'multimedia' remains unchanged, and scores for 'spreadsheets', 'desk top publishing', 'presentation', 'multimedia' and 'web page development' remain below the mid point of 3.

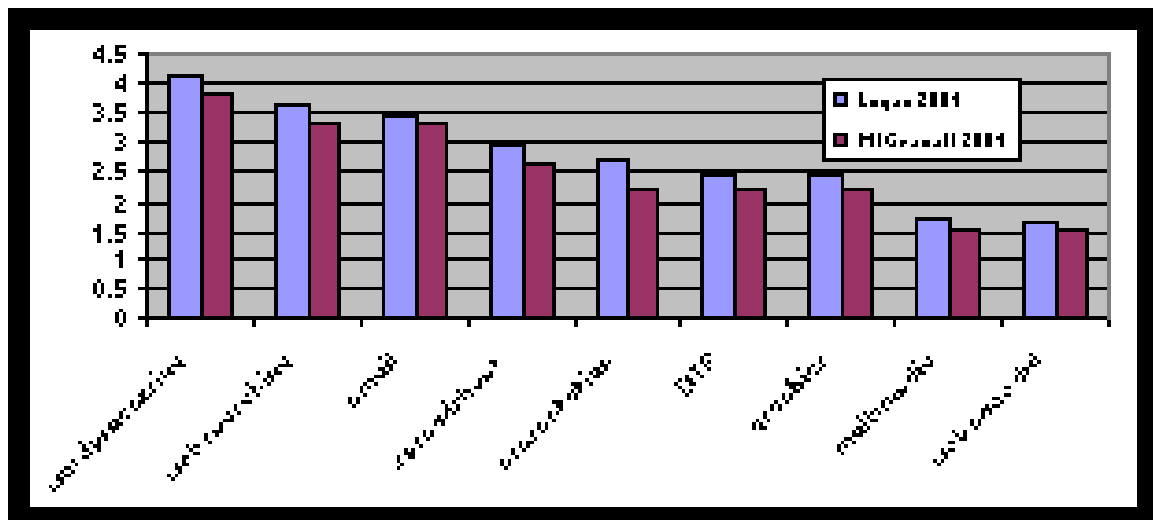


Figure 2. Self-evaluation scores for computer skills by campus in 2001

Campus comparisons for self-evaluation of computer skills for 2001 are shown in Figure 2. This Figure shows a consistent higher self-evaluated competence in all skills for Logan than for Mt Gravatt. This is the reverse of the situation in 1999 where except for wordprocessing that had the same score on both campuses, Mt Gravatt recorded higher scores on all skills. The authors can only speculate on this turn around but one suggestion is that the lower socio-economic catchment area of the Logan campus has attracted disproportionately more funding and attention in the information technology area than has MtGravatt.

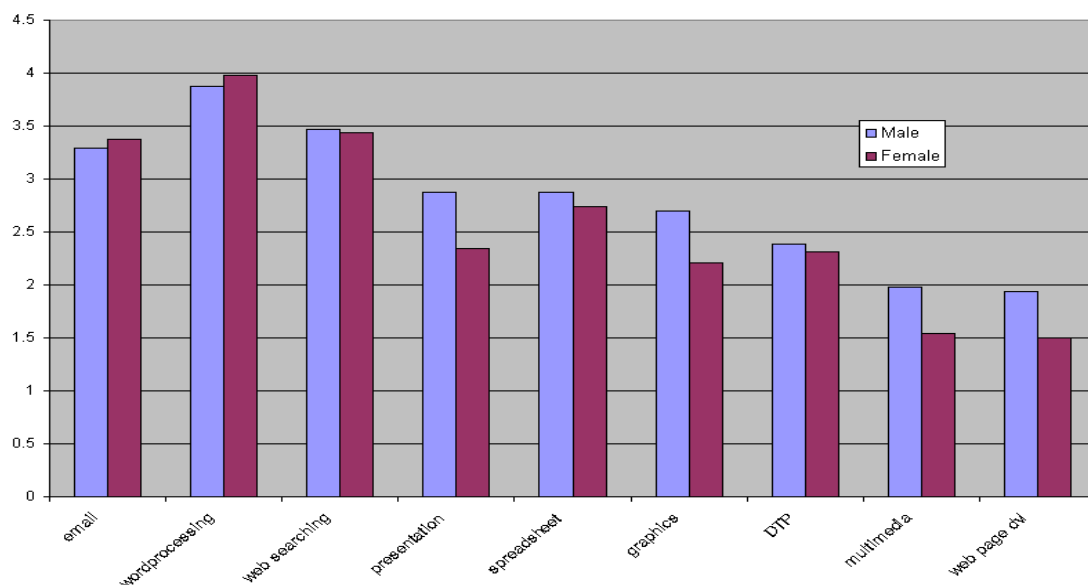


Figure 3. Self-evaluation scores for computer skills by gender 2001

Gender comparisons of self-evaluation of computer skills for 2001 are shown in Figure 3. The only skills in which females scored themselves higher than males were

wordprocessing (3.38/3.29) and web searching (3.98/3.88). The skills in which the biggest discrepancies of male scores over female scores occurred were ‘presentation’ (2.88/2.34), ‘graphics’ (2.7/2.21), ‘multimedia’ (1.98/1.54) and ‘web page development’ (1.94/1.5). Similar outcomes are reported by Denning and Selinger (1999) who audited the ICT skills of 983 preservice teachers in the United Kingdom. In all but four of the skills males recorded greater competency than females. In two of the skills, ‘word processing’ and ‘using a spreadsheet to store and print lists and tables’, males and females recorded equal competency and in two skills, ‘cut, copy and paste material’ and ‘enter text, correct errors’, women recorded higher competency than males. When we look at the more exciting skills like modeling and simulation software, multimedia authoring and web page design we find that males are between 3 and 5 times more likely to have these skills although in general very few of the participants in the survey had these skills.

In *Real Time* (Meredith et al., 1999) noted above, a gender breakdown of skills is not given but the report notes that "the most consistent finding is that **not** having a skill is significantly associated with being over 50 years old, female, and a primary school teacher"(p. 151). It also notes that male teachers appear to be more likely than female teachers to engage with a range of IT uses with 80% of males and 73% of females having the full complement of basic skills and 17% of males and 7% of females having all the advanced skills (p.156). Furthermore male teachers are significantly more likely than female teacher to use a computer every day (p.168) and to report that they enjoyed using computers a great deal (35% of males and 27% of females, p.170).

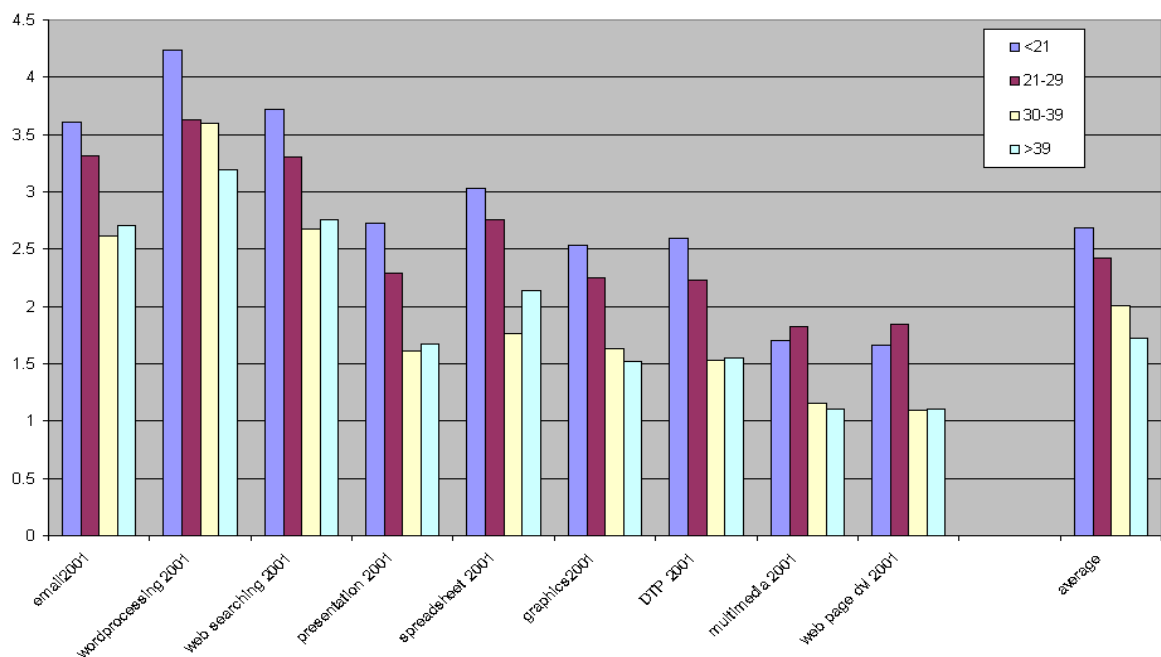


Figure 4. Self-evaluation scores for computer skills by age 2001

Figure 4 shows the age differences in self evaluated computer skills. Students aged under 21 recorded the highest scores in all skills except ‘multimedia’ and ‘web page development’ where the 21-29 age group scored highest. The far right of Figure 4 shows the average of all skills and indicates decreasing skill levels with age. This no

doubt reflects school experience but as the following section shows there are other places in which the students gained ICT experience.

2.4 Previous experience

Students were asked a number of questions to determine their previous experience with computers at home, school, other training institutes or work. Table 8 provides details of home ownership of computers. There has been small growths in home ownership (89.83%/91.58%), being the main user of the computer (58.17%/64.52) and having a computer less than two years old (53.39%/54.62%).

Home computer	1999 %	2001 %
Have a home computer	89.83	91.58
Used mainly by me	58.17	64.52
Computer less than 2 years old	53.39	54.62

Table 8. Home computers compared over time

The changing pattern of computer use at school is shown in Table 9. As would be hoped there is growth in 'frequent' school users (23.91%/34.21%) which is accounted for by the growth in under-21 year old who used the computer 'frequently' at school (34.52%/46.99%). However, there is also a slight growth in the percentage of students who 'never' used a computer at school (21.10%/22.44%) which could probably be accounted for by the slight growth in the older student population who are much less likely to have computers in their schooling. Students who took a special computer school subject rose over the course of the study (11.72%/15.46%) with 22.63% of under-21 year olds taking such a subject in 2001.

Used a computer at school	1999 %	2001 %
Never	21.10	22.44
Little	53.99	43.23
Frequently	23.91	34.21

Table 9. Changes in pattern of computer use at school over time

Students were also asked if they had done computer training at TAFE or other institute apart from school and 23.97%/24.18% have done such training with the most likely (44.64%) age group to have taken such a course being of 21-29 year olds. 'Frequent' computer use at work declined slightly from 22.97% in 1999 to 20.88% in 2001 with 30-39 year olds being the most likely (31.58%) age group to be in this category.

The gender differences in previous experiences are shown in Table 10. It can be seen that males are more likely to own a home computer (94.12%/91.06%), be the main user of it (68.09%/63.79%) and have a computer that is less than two years old (62.79%/53.0%). They are also more likely to use a computer at school (38.46%/34.81%) and work (30.43%/19.12%) 'frequently'. Females are more likely to taken a special computer subject while at school (17.32%/6.0%) and have undertaken computer training outside of school (76.86%/70.59%).

	Male	Female
Have a home computer	94.12	91.06
Used mainly by me	68.09	63.79
Computer less than 2 years old	62.79	53.00
Used a computer at school frequently	38.46	34.81
Special subject	6.00	17.32
Computer training	70.59	76.86
Used at work frequently	30.43	19.12

Table 10. Previous computer experience by gender

It is clear that between the use of their home computer, work and non-school training students gain considerable experience using ICT that will factor in to their attitudes to using ICT in learning and their competency base as incoming preservice education students.

3. Ramifications for preservice ICT education

Strudler and Wetzel (1999) report on the factors affecting technology integration in preservice programs in a number of 'exemplary' colleges. Among their 'enabling factors' they include: leadership, vision and goals; training and support; access; pedagogical 'fit'; and personal issues. They note that "all the programs ... had a required educational technology class for preservice teachers that was usually designed for students to take early in the sequence of courses"(p.74). They also note that "in each institution technology integration was part of the larger plan for preparing students to teach with technology". The data discussed in the previous section derive from a program that has similar aims to Strudler and Wetzel's 'exemplary' programs . The students experience the *Learning with Information Technology* subject in their first semester. It is followed by another core subject that addresses the aims of the Technology Key Learning Area. Students can then chose to study a four subject Learning Technology major, do an Honours component in the ICT area or take miscellaneous ICT elective subjects. There is also an aim that students will experience ICT within other subject areas although there is no methodological evaluation to ascertain if this takes place or what ICT experiences

they encounter. *Learning with Information Technology*, like most subjects at tertiary level, is founded in the '3 Ps' – pedagogy, politics and practicality. Although it would be desirable to consider only pedagogy when we design subjects it is inevitable that politics and practicality will contribute to the shape of subjects. The politics that shaped *Learning with Information Technology* were both external and internal. Included in the external politics was the demand from employers that our graduates could demonstrate ICT in learning competencies that were concomitant with the aims of *Schooling 2001* (Education Queensland, 1997). It is also necessary that from time to time the university be able to demonstrate that their teacher education program encompasses the political demand for ICT literate teachers to meet the needs of the 'information society' discussed earlier in this paper. While pedagogically it is preferable to integrate ICT throughout the preservice program, politically it is much more expedient to be able to point to a dedicated subject. It is also a reality that a dedicated subject ensures all students attain some basic competencies for ICT in learning whereas a purely integrative policy is much more haphazard and is dependent on the ICT interests of a constantly changing, and increasingly sessionalised, academic population. Internal politics included the demand from other subject areas that the subject provides students with the ICT skills necessary for them to use ICT in other subject areas. Practicalities included demands on computing facilities, technical support and software availability. A further practicality is the issue of staffing such a subject where there is a heavy reliance on sessional staff and the only full-time staff member is the convenor.

As Schrum (1999) points out "learning about technology is a nontrivial and life-changing event, and is qualitatively different from learning other new skills, knowledge, and activities. Anyone who has struggled to learn about technology, or who has taught others to use it, is aware that brief exposure does not provide sufficient training or practice to incorporate technology into a classroom" (p.84). For anyone who has spent any time in ICT professional development either at the preservice or inservice level, Schrum's words would ring true. As the data above show, there are considerable differences in the attitudes, skills and previous experiences of incoming students. In many traditional teacher preservice subjects such as educational psychology, ethics or teaching methods, the academic designing the subject can reasonably assume that their students have little previous experience with the subject or strong preformed attitudes about it. This is not the situation with ICT. It is evident in the above data that there are considerable variations in experience and attitude in incoming teacher education students; that these variations have age, gender and campus bases; and furthermore that there are marked changes over as short a time span as two years. All of these factors create design issues that challenge academics responsible for the delivery of ICT based subjects. Following are some brief suggestions of a variety of possible mechanisms for dealing with some of these issues. These should in no way be construed as 'answers' to this problem because the changing nature of ICT will mean that we will need to constantly reappraise our ICT preservice programs.

3.1 Content

There is no doubt that an ICT subject that is heavily skills based exacerbates the issues listed above. Traditional ICT skills such as wordprocessing, spreadsheets and databases will undoubtedly be the skills where there is the greatest divergence

between abilities. Students with little skills who come into classes where they quickly realise that other students are much more competent will be intimidated and this will play on any existing technology phobias. But skill-free content raises its own difficulties. How can students learn about problem solving that has a mathematical component when they do not know anything about the potential of spreadsheets to be a tool in that problem solving? How can students carry out 'rich tasks' that involve information gathering and analysis if they do not understand the power of a database to manage information? However teaching applications has always been a waste of time because of the rapidly changing nature of software and the impossibility of pitching the teaching to an appropriate student level. Ability streaming is long been posed as a solution to student populations with great variance. However experience shows that with ICT much is lost in such groupings because lack of previous experience with ICT does not necessarily equate with limited ability. Some students who come in with little or no skill will quickly pick up the required skill and the group's ability level will soon diverge. Furthermore the less experienced students are not being exposed to the wealth of ideas available in the more able groups. In *Learning with Information Technology* the intention is to de-emphasise the learning of skills and move rapidly through a wide range of applications that have potential to enhance learning in the primary school. The students are made aware of ways to gain skills but they are not generally taught in any detail during the formal subject workshops or lectures. While this intention is explained to students on a number of occasions, many fail to grasp the idea. This is not surprising when the response to the survey question concerning learning 'everything' about computer in this subject is considered. Many students expected to learn 'everything' and they find it difficult to give up this notion. The movie *Jerry Maguire* where the football player keeps saying 'show me the money' could easily translate to teacher preservice courses where the students keep saying 'teach me the skill' while academics are valiantly trying to provide them with sound theoretical bases for their practice.

3.2 Structure

The structure of the subject both in its delivery and assessment need consideration within the issues listed above. *Learning with Information Technology* is delivered in traditional forms of lecture and workshop with the enhancement of more modern flexible online components. Lectures introduce the concepts and ideas of the subject such as rationales for using ICT in learning, relevant policy documents, barriers to ICT integration into learning, equity and management issues. The concepts and ideas are also supported with extensive online material and a *Book of Readings* available for purchase. In the 1999 delivery of the subject one campus had a lecture series while the other campus relied on the online material. Evaluation of the subject in that year showed that students preferred to have both lecture and online material. Workshops are used for discussion, application introduction and group projects. Assessment is in the form of a short essay exam on the concepts, a portfolio showing ways of using various applications in learning and a group hypermedia project. In 1999, the campus that did not have a lecture had a two hour workshop while the other campus had a one hour lecture and a one hour workshop with both campuses having extensive ICT based support for further student directed learning. These structures were partly determined by available facilities where there were no lecturing facilities on one campus and limited computer laboratory facilities available for workshops on the other. The campus with the one hour workshop objected strongly to their limited

workshop time. Subsequently both campuses now have a one hour lecture period and a two hour workshop. A recent poll of students shows that they now want smaller classes with more tutors in them - which of course would be ideal but beyond the funding possibilities of the university. The extensive online and computer based material remains under-utilised and not the students preferred way of learning.

3.3 Support

Support can take many forms including human, print, computer and institutional. In *Learning with Information Technology* we sought to support students with a limited skill base by making available computer delivered tutorials in the basic skills. As noted above these were poorly utilised and the student preference was clearly for human delivery. Some students even suggested that the lecture periods be used to teach skills - a clear focus on 'teach me the skill' and a well proven ineffective way to learn ICT skills. The subject clearly has a brief to ensure a reasonable ICT skill base in the student population, but the best way to meet the students' variable needs remains unclear. The best practice seems to be to provide a wide range of learning scenarios. One possibility is to instigate a 'self-paced' skills segment where a well organised series of tutorials and testing could be put in place so that experienced students could simply sit the tests and demonstrate their skill while the less able could avail themselves of specialist tutorials and sit the tests when they attain the skill. Such a program has worked effectively in other areas of the university where students entered the program with variable levels of a necessary skill. It of course has ramifications for tutor availability and computer laboratory space. It may be possible to meet the tutoring needs from another student population within the education faculty. The faculty also conducts a preservice course for secondary teachers who are intending to teach computer subjects. These students could be given credit within one of their computing curriculum subjects for acting as tutors and would get valuable teaching experience at the same time.

Other support that has been rather overlooked so far but could be employed more effectively include suitable print material (such as generic ICT texts) and generic ICT skills courses that are provided free by other segments of the university.

Conclusion

It is always a fine line in designing subjects at the tertiary level that provide sufficient challenge and academic rigour while maintaining reasonable levels of student satisfaction. This seems to be particularly true in ICT subjects in teacher preservice programs where the population is so diverse both in age and ICT experiences, compounded by disproportionate number of female students whose cultural experiences do not support technological affinity. It is tempting to try to meet the student demand for more focus on skill training but the emphasis of ICT subjects in teacher preservice programs must remain firmly on the role of ICT in learning and the principles of life-long and semi-autonomous learning should prevail even if it puts many students outside their comfort zone. The data in this paper also show how important it is to keep monitoring incoming populations and constantly re-appraise ICT programs.

Reference List

AAUW (2000). *Tech-Savvy: Educating girls in the new computer age*. Washington DC: American Association of University Women.

Australian National Training Authority (2000). *Learning for the Knowledge Society: An education and training action plan for the information economy*. Canberra: ANTA www.detya.gov.au/edu/adactplan.htm

Clarke, Valerie & Chambers, Susan (1989). Gender-based factors in computing enrolments and achievement: Evidence from a study of tertiary students. *Journal of Educational Computing Research*, 5: 409-429.

Denning, Tim & Selinger, Michelle (1999). Patterns of change and innovation in preservice education. *Proceedings of SITE99*, San Antonio, Texas.

Education Queensland (1997). *Schooling 2001*. Brisbane: Publishing Services, Facilities and Services, Education Queensland.

Education Queensland (2000a). *New Basics Project Technical Paper*. <http://education.qld.gov.au/>

Education Queensland (2000b). *Literate Futures: Report of the Literacy Review for Queensland State Schools*. <http://education.qld.gov.au/>

Gill, Rosalind & Grint, Keith (1995). The gender-technology relation: Contemporary theory and research. In Keith Grint & Rosalind Gill (Eds), *The Gender-Technology Relation: Contemporary theory and research* (pp.1-28). London: Taylor & Francis.

Meredyith, Denise ; Russell, Neil ; Blackwook, Leda; Thomas, Julian and Wise, Pat (1999). *Real Time: Computers, Change and Schooling: National sample study of the information technology skills of Australian school students*. Commonwealth Department of Education, Training and Youth Affairs and Australian Key Centre for Cultural and Media Policy, Griffith University.

Penley, Constance (1991). Brownian motion: Women, tactics, and technology. In Constance Penley & Andrew Ross (Eds), *Technoculture* (pp.135-162). Minneapolis: Uni. of Minnesota Press.

Ropp, Margaret Merlyn (1999). Exploring individual characteristics associated with learning to use computers in preservice teacher preparation. *Journal of Research on Computing in Education* 31(4): 402-417.

Schrum, Lynne (1999). Technology professional development for teachers. *Educational Technology, Research and Development*, 47(4): 83-91.

Stabile, Carol (1994). *Feminism and the Technological Fix*. Manchester: Manchester Uni. Press.

Strudler, Neal & Wetzel, Keith (1999). Lessons from exemplary colleges of education: Factors affecting technology integration in preservice programs. *Educational Technology, Research and Development*, 47(4): 63-81.

Teague, Joy; Wilss, Lynn & Clarke, Valerie (1996). Women and computing: Some cultural perceptions and differences. *Australian Educational Computing*, 11(2): 34-39.

The New London Group (1996). A pedagogy of multiliteracies: Designing social futures. *Harvard Educational Review*, 66(1): 60-92.

Turkle, Sherry (1984). *The Second Self: Computers and the human spirit*. New York: Simon & Schuster.

Wood, Julia (1994). *Gendered Lives: Communication, gender, and culture*. Belmont, California: Wadsworth.

Yelland, N. and Bigum, C. (1995) A professional development model for primary teachers participating in a computer technology program for schools. *Australian Educational Computing*, 10(2): 24-26.