

Education students' views on the integration of ICT into their undergraduate learning experiences

Dr Glenice Watson, Centre for Applied Language, Literacy and Communication Studies, Griffith University, Dr Romina M.J. Proctor, Centre for Learning Research, Griffith University, Dr Glenn Finger, Centre for Learning Research, Griffith University and Mr Wayne Lang, Centre for Learning Research, Griffith University

Abstract

It is well understood that university graduates, regardless of discipline, must have appropriate information and communication technology (ICT) competencies to function and be employable in the modern world. Universities have been encouraged to develop action plans for ICT literacy and to introduce means of auditing ICT literacy levels of students. In addition, education graduates have had additional responsibility to develop ICT competencies to support student learning. The extent to which this is actually being achieved is less well understood. This paper reports on one aspect of a project designed to inform the integration of ICTs within undergraduate programs for the preparation of primary and secondary teachers at an Australian university. Initially survey data were collected that explored the students' competence with ICT applications and their confidence with ICT integration in their teaching pedagogy. This paper reports on interviews with students to provide in-depth understanding of their ICT experiences as undergraduates. It supports survey findings that considerable difference exists between individual experiences within and between programs depending on course selection, study plans and personal inclination. It also raises serious questions about the capacity of many graduates to undertake ICT aspects of their profession without extensive and immediate further professional development. The paper concludes by exploring how some of this variance can be addressed to ensure that graduates are more ICT capable.

Introduction

It is well understood that university graduates, regardless of discipline, must have appropriate information and communication technology (ICT) competencies to function and be employable in the modern world (DETYA, 2000; National Research Council, 1999; Winship, 2001). In attempting to position Australia within a "knowledge society" and an "information economy", *The Way Forward* (DETYA, 2000) identified within its strategic priorities that "graduates enter the workforce with the information technology literacy ... skills needed in the information economy" (p. 5). In addition to the requirement that all university graduates have appropriate ICT competencies, education graduates have additional responsibility to develop ICT competencies to support the learning of the students in their future classrooms. For example, ICT standards for teachers have been identified for the United States (ISTE, 2000) and the United Kingdom (BECTA, 2003), and in Australia a framework for teacher ICT competency has been proposed (DEST, 2002). In Queensland, the Board of Teacher Registration (2002) requires in its professional standards that graduates are "proficient in the use of ICT in learning environments" (p. 6), while Education Queensland (2003) identifies key areas of ICT curriculum integration and sees "smart teachers" using ICTs as central to their *Education and Training Reforms for the Future* (Education Queensland, 2004). To measure the extent of ICT integration, Education Queensland has incorporated into its annual accountability data collection an *ICT curriculum integration performance measurement instrument* (Proctor, Watson & Finger, 2003). In addition, a range of other research directed more at student standards with ICTs either implies, or directly refers to, concomitant ICT competencies required of teachers (Cox & Abbott, 2004; IEA, 2003).

While the need for graduates to have ICT competencies is well understood, the degree to which this is being achieved is less clear. As Winship (2001) noted, "at the

organisational level, IT Literacy is not in very good shape to achieve the vision of *The Way Forward* and "IT Literacy of students appears to be very variable across and within ... universities" (p. 5). Similarly, with respect to education graduates, while the Australian Council of Deans of Education (ACDE, 2001) proposed that "technology will become central to all learning", DEST (2001) noted with respect to ICTs in tertiary teacher education programs that "while 75% expected all teacher education staff to integrate technology in the teaching of their subjects only 38% reported their staff actually doing so on a regular basis" (p. 39). To support the closer alignment between understandings of the need for ICT competencies in graduates and the actualities, the Council of Australian University Directors of Information Technology (Winship, 2001) sought to identify the ICT literacy required of all tertiary students and academic staff and encouraged universities to develop action plans for IT literacy that included "means of auditing IT literacy levels of staff and students on an on-going basis and of monitoring performance in achieving the goal of IT literacy" (p. 43). Winship identified issues relating to ICT literacy of university students that included: the spurious assumption that school leavers will have advanced ICT competencies; ICT literacy cannot be assumed in the case of mature-age students; ICT literacy is not a "once in a lifetime one shot injection but a lifelong continuum" (p. 33); and even students entering university with ICT competencies will require upskilling during the life of their university course.

In summary, there are identifiable expectations that all university graduates will have developed an array of ICT competencies and that education graduates have additional responsibilities in this regard. This paper reports on one aspect of a project designed to inform the integration of ICTs within undergraduate programs for the preparation of primary and secondary teachers at an Australian university. The project is intended to enhance the learning outcomes of students in these programs in order to ensure that Australian and Queensland standards are being met. The project has two phases. The first is an auditing phase, employing survey and interview methodology, and is concerned with current education students' experiences in their respective programs. Findings from the survey aspect of this phase are published in Watson, Proctor, Finger and Lang (in press). This paper reports on findings from the student interviews aspect of this phase. The second phase of the project employs action research methodology involving teaching staff in the programs and is concerned with future education students' experiences.

Method

As noted above, data collection in the audit phase of the project has involved survey and interview. The survey (N=217) of fourth year students in the programs elicited general data regarding gender, age, program details, interest in using computers, and current access to computers and the Internet. It also generated Likert scale data of self-identified competency with a range of ICT applications and confidence with a range of examples of ICT integration. Finally, the survey invited open-ended responses regarding strengths of and recommendations for improvement to the programs as preparation for ICT integration into their students' learning when the participants became teachers. In general terms, the findings (reported in Watson et al. in press) showed that the participants had high levels of computer and Internet availability and held strong beliefs that computers can improve student learning outcomes. The participants' self-perceptions of their competence with ICT applications revealed a limited band of applications with which the participants expressed high levels of competence, while a high percentage of participants perceived themselves as having no competence with particular applications, and this especially applied to applications that could be stimulating for improving learning outcomes in their future students. Participants generally perceived their confidence to integrate ICT into student learning more highly than they perceived their competence with ICT applications, however the high percentage of the cohort who rated themselves as having no confidence with particular integration examples was again noted.

Interview methodology (Holstein & Gubrium, 1997) was employed to obtain more nuanced understandings of the survey findings. Interviews (N=7) were conducted with fourth year students using a semi-structured format with the interview protocol being informed by findings from the survey. To encourage openness, the interviews were conducted by an experienced research assistant who had no academic or social connection to the students. Interviews were audiotaped and transcribed. Thematic analytical technique (Patton, 2002) was applied to the interview transcripts. As Byrne (2001) notes, "thematic analysis is a way of seeing, as well as a process for coding qualitative information" (p. 904). A cross-case approach is taken in this paper, that is, the analysis involved a search for "patterns and themes that cut across individual experiences" (Patton, 2002, p. 57). Further examples of thematic analysis, including Corbett (2001) in relation to women scientists, Gwyn-Paquette (2001) with respect to reflection in preservice education, and Watt (1999) on the experience of racism, were used as reference points for this form of analysis. The thematic analytic process was employed as follows. The initial thematic analysis occurred concurrently with the transcription process, which was soon after the completion of each interview. During each interview an impression was formed of some of the themes important for that participant; the transcription process was thus a second listening to the talk while alert to possible themes. At the end of the transcribing, the identified themes were used as headings and pertinent excerpts to illustrate each theme were aligned with each heading. When transcribing subsequent interviews, excerpts were placed under the existing headings and, when a new theme emerged, a new heading was created. The previous transcript/s was/were then perused again for reference to the new theme (the cross-case approach). This process allowed analysts to sort sections of the data according to themes. The allocation of themes was thus data driven, in a bottom-up manner, rather than imposed on the data in a top-down manner driven by the analysts (Johnson, 1999).

Themes

The intention behind conducting interviews as an aspect of the auditing phase of the project was to provide more nuanced understandings of the survey findings. Therefore this section will explore some of the themes that were important to the interview participants. These themes are explored under the following general headings: understanding the need for ICT integration, understanding the potential applications of ICT in learning, and understanding of barriers to ICT integration. To assist clarity in the following discussion, all references to "students" will imply the student (child) in the future primary or secondary classroom of the preservice teacher participants; the survey participants will be referred to as the "cohort" and the interviewees as the "participants".

Understanding the need for ICT integration

Literature cited above noted the well-understood need for teachers to have appropriate ICT competencies to support student learning in their classrooms. In the survey preceding the interviews that furnish the data for this paper, the cohort from which the interview participants were drawn had indicated a strong belief that computers can improve student learning outcomes. One theme with respect to the need for ICT integration related to lived ICT experiences of their future students, for example:

... students seem to just have a natural motivation to use ICTs ... because of kind of the generation that's coming through now they've kind of developed it from a young age and it's kind of more so than say when I went to school ...

Another theme within this understanding related to seeing ICT as educationally motivational for students, thereby impacting positively on student behaviour:

... all the kids enjoy using the computers and enjoy learning on them so that motivation and that um you know behaviour management sort of is kept to a minimum ...

This motivational factor was perceived as applying even to students for whom ICT competence was seen as challenging:

... generally kids will just come in and they love getting on the computer um even those that find it hard will still kind of I don't know get in and do it ... they are more inclined to continue with the work that's provided for them ...

The academic potential of ICT integration, particularly with respect to meeting the diverse needs of learners, was also identified as a theme:

... it provides another way of presenting information that students can ah learn from basically and it just it kind of addresses the various and diverse learning needs of students therefore ICT it helps you to ah portray the information more visually on most senses ...

While the above excerpts all related to understandings with respect to the future students of the participants, one participant expressed this in terms of meeting the criteria of future employers.

... because it comes a key issue when you address the key selection criteria for your teacher application that ICT is utilised within your teaching practices so I think there needs to be some sort of link between university preparation course to what employers are basically looking for ...

These excerpts from interview transcripts provide some insights into the cohort's strongly held belief, as expressed in the survey findings, that computers can improve student learning outcomes. For the interview participants this belief is nuanced in terms of their future students' life experiences; the motivational potential and its positive impact on behaviour; and its academic potential for meeting the diverse needs of learners. It would be expected that these participants understood the need for ICT integration in terms of the learning of their future students, as preservice teachers have been shown to have a close alignment with their future profession and to be altruistically motivated towards this profession by beliefs of making a difference to children's learning (Teven, 2001; Watson, Johnson & Austin, 2004).

Understanding the potential applications of ICT in learning

The cohort survey had generated quantitative data on self-perceptions of competence with ICT applications and confidence with ICT integration. It was found that a large percentage perceived themselves as having no competence with a range of applications that could be considered more educationally interesting and productive to students (multimedia development, visual thinking software, digital video editing and web page development). It was also found that despite the limited range of applications with which the cohort perceived themselves to be competent, they perceived themselves to have reasonable confidence to integrate ICT into student learning over an extensive range of student activities involving ICT (see Watson et al., in press). While the interview participants were not directly asked to identify potential applications, most of them did so while responding to the interviewer's suggestion that they talk about their ICT experiences during their preservice program. Some of this understanding related to relatively simple applications such as using spreadsheets to do graphing:

... one of the courses was ah using Excel to do graphing and yep I was able to teach that you know step by step and give them instruction lists and you know have the step by step instructions printed out for every student and was able to do the demonstration on the board...

However, there is considerable difference between the understanding expressed in the above excerpt that was conceptualised as the teaching of skills and the following excerpt which integrates the application:

... especially when you're looking at heart rates and using you can utilise heart rate monitors and then actually go on to computers to graph that information or if your school is really well off and they've got the infrared heart rate monitors it basically transfers straight into computer but um you can go on to graph information and use it that way for HPE ...

Some of the talk was constructed as lack within their programs.

... more information on like CD-Roms we can use within the subjects would be good because we don't really get very much information about that like which CD-Roms can enhance the learning in classrooms for Maths and English ...

Somewhat paradoxically, some of the understanding related to more sophisticated applications for which a high percentage of the cohort in the survey had perceived themselves as having no competence:

I know with the English at the moment they're teaching them to do a web page like within the English content studies so maybe with things like that building web pages um ... using Flash would be another like teaching of multimedia because I think a lot of people find that fun and I think kids find that fun as well so ...

Although there were instances, as indicated by the above excerpts, where there were clear perceptions of possibilities for ICT integration, these were surprisingly limited considering the extensive literature on this over the last 20 years (for a review of this literature see Maddux, 2003) and the participants' clear understanding of the need for ICT integration. While this may be partially explained from the interview technique that allowed the participants to identify their own themes within the general request to talk about their ICT experiences, some of it may relate to perceived barriers with ICT integration.

Understanding of barriers to ICT integration

Open-ended questions in the survey had asked the cohort to identify strengths and recommend improvements in the ICT experiences within their programs. Content analysis of these responses identified the provision of practical real life experiences with applicability to the classroom as the most frequently indicated strength. Ironically this was also nominated as a recommendation for improvement. The interview talk focussed on lack rather than strength:

I think Science and Music are the only ones that they really said look this is you can use this in this subject in you classroom this is something you can use whereas the other subjects didn't really give us anything ...

Some of this lack related to classroom management strategies, for example:

... it just needed to be a bit more focused for us on the sorts of things everyday problems that we were going to encounter I think just a lot of us hadn't considered (laugh) the extent of the issues that there were and you plan a lesson and then realise oh hang on I've got thirty kids and I've got two computers ...

Another perceived barrier related to lack of modelling of ICT integration by academic staff, even to the extent that this constituted not just omission but active discouragement:

... here at university I've done one presentation with PowerPoint and that was a bit of a drama (h) just to get the equipment here um we can't as students can't get access to the equipment to do that um our lecturer had to do that he wasn't too happy about that but he did do it for us and then we couldn't get a laptop ... he was a bit reluctant about it cos he was worried that things would go wrong and it would take too much time in the process of the tutorial to set up and everything ...

Participants also identified lack of incentive as a barrier:

... there's no assignments that specify you must use ICTs within this assignment um so yeah so there's no encouragement in that way for people to learn to use them or have to cope and learn to use them ...

In addition, these barriers were seen as impacting differently depending on the individual experience with, and interest in, ICT integration. This was generalised by one participant as follows:

I'm not sure whether all people that go to uni are comfortable with a variety of programs that could be used I think most people are pretty comfortable with doing Word documents and typing up stuff but I feel that and you see it a lot not many people opt for PowerPoint presentations when doing oral presentations those sorts of things so I think there's a need for a lot more opportunity for ICT to be integrated into the course um and then it'd be up to the individual ...

These excerpts provide some insights into the participants' understanding of the barriers faced by the cohort with respect to ICT integration. Themes in these understandings include lack of provision of classroom applications within their program, lack of technology management techniques, lack of modelling of ICT integration by academic staff to the point of active discouragement, and lack of incentive by way of assessment criteria. These barriers were experienced by participants differently depending on their own study program. It is not surprising that these *preservice* teachers identified barriers to ICT integration, both to their own learning and to their future students' learning, as similar barriers to the integration of ICT into student learning are perceived by *inservice* teachers (see for example Pelgrum, 2001).

Conclusion

This paper draws on interview data to provide nuanced understandings to complement survey data in the audit phase of a project designed to inform the integration of ICTs within teacher preparation programs. It has employed thematic analysis to identify ICT concerns of participants within the programs. These themes have been addressed under the general headings of understanding the need for ICT integration, understanding the potential applications of ICT in learning, and understanding of barriers to ICT integration.

It is clear that the participants, in keeping with the cohort generally, had a strong belief that there was a need for ICT integration, and this was expressed in terms of seeing ICT as an integral part of the students' life experience, perceiving ICT in learning as motivational thus resulting in positive behavioural outcomes, and meeting the needs of a diverse range of learners. Some participants were able to identify sophisticated examples of ICT integration in student learning, but it was noted that these integration examples required competence with advanced ICT applications with which many of their cohort in the survey aspect of the project had perceived themselves as having no competence. Much of the talk in the interviews was constructed around lack and some of this is identified as barriers to ICT integration. These barriers included lack of provision of ICT classroom integration examples, lack of technology management techniques, lack of modelling in ICT integration by academic staff to the extent that this could be seen as active discouragement from using ICT, and lack of incentive to use ICT in terms of assessment criteria. Different participants experienced these barriers differently depending on their particular study program.

This paper points to the importance of testing the clearly understood expectation that all university graduates have developed an array of ICT competencies appropriate to their future profession within particular domains. For the preservice teachers who constitute the research cohort for the project described in this paper, it is clear that there is considerable distance between their understanding of the importance of ICT in their

profession and their confidence to integrate ICT in their professional setting to meet the needs of their clients (students) and the expectations of their potential employers. The nuanced understandings provided in this research suggest directions for closing some of this distance between belief and practice.

References

- Australian Council of Deans of Education (ACDE). (2001). *New learning: A charter for Australian education*. Canberra: ACDE.
- Board of Teacher Registration, Queensland. (2002). *Professional standards for graduates and guidelines for preservice teacher education programs*. Retrieved 8 August, 2004 from <http://www.btr.qld.edu.au/>
- British Educational Communications and Technology Agency (BECTA). (2003). *Primary schools – ICT and standards: An analysis of national data from OFSTED and QCA by BECTA*. Retrieved 18 January, 2003 from <http://www.becta.org.uk/research/reports/ictresources.cfm>
- Byrne, M. (2001). Data analysis strategies for qualitative research. *AORN Journal*, 74(6), 904-905.
- Corbett, J. (2001). Women, scientists, agitators: Magazine portrayal of Rachel Carson and Theo Colborn. *Journal of Communications*, 51(4), 720-749.
- Cox, M., & Abbott, C. (Eds.). (2004). *A review of the research literature relating to ICT and attainment*. Coventry: Becta/London: DfES. Retrieved 16 February, 2004 from <http://www.becta.org.uk>
- Department of Education, Science, & Training (DEST). (2002). *Raising the standards: A proposal for the development of an ICT competency framework for teachers*. Retrieved 4 November, 2003 from <http://www.dest.gov.au/schools/publications/2002/raisingstandards.htm>
- Department of Education, Science, & Training (DEST). (2001). *Making better connections: Models of teacher professional development for the integration of information and communication technology into classroom practice*. Canberra: DEST.
- Department of Education Training and Youth Affairs (DETYA). (2000). *The way forward – Higher Education action plan for the information economy*, incorporated in *Learning for the knowledge society – An education and training action plan for the information economy*. Retrieved 8 August, 2004 from <http://www.edna.edu.au/highered/actionplan/>
- Education Queensland. (2004). *Education and Training Reforms for the Future*. Retrieved 8 August, 2004 from <http://education.qld.gov.au>
- Education Queensland. (2003). *Information and Communications Technology (ICT) Continua*. Retrieved 11 April, 2003 from <http://education.qld.gov.au/curriculum/learning/technology/cont.html>
- Gwyn-Paquette, C. (2001). Signs of collaborative reflection and co-construction of practical teaching knowledge in a video study group in preservice education. *International Journal of Applied Semiotics*, 2(1), 39-60.

ETL Conference, 2004, Logan Campus, Griffith University: Glenice Watson, Romina Proctor, Glenn Finger & Wayne Lang

Holstein, J., & Gubrium, J. (1997). Active interviewing. In D. Silverman (Ed.), *Qualitative research: Theory, method and practice* (pp. 113-129). London: Sage.

International Association for the Evaluation of Educational Achievement (IEA). (2003). SITES Research Projects Overview. Retrieved 1 February, 2003 from http://sitesm2.org/SITES_Research_Projects/sites_research_projects.html

International Society for Technology in Education (ISTE). (2000). *National educational technology standards for teachers*. Retrieved 7 April, 2004 from <http://cnets.iste.org/intro.html>

Johnson, G.C. (1999). Telling tales: A complicated narrative about courtship. *Narrative Inquiry*, 9(1), 1-23.

Maddux, C. (2003). Twenty years of research in information technology in education: Assessing our progress. *Computers in the Schools*, 20(1/2), 1-10.

National Research Council (1999). *Being fluent with Information Technology*. Committee on Information Technology Literacy. Washington DC: National Academy Press. Retrieved 7 April, 2004 from <http://www.nap.edu/catalog/6482.html>

Patton, M. (2002). *Qualitative research and evaluation methods* (3rd ed.). Thousand Oaks: Sage.

Pelgrum, W. (2001). Obstacles to the integration of ICT in education: Results from a worldwide educational assessment. *Computers & Education*, 37, 163-178.

Proctor, R., Watson, G., & Finger, G. (2003). Measuring Information and Communication Technology (ICT) curriculum integration. *Computers in the Schools*, 20(4), 67-88.

Teven, J. (2001). The relationships among teacher characteristics and perceived caring. *Communication Education*, 50, 169-169.

Watson, G., Johnson, G.C., & Austin, H. (2004). Exploring relatedness to field of study as an indicator of student retention. *Higher Education Research & Development*, 23(1), 57-72.

Watson, G., Proctor, R.J., Finger, G., & Lang, W. (in press). Auditing the ICT experiences of teacher education undergraduates. *Australian Education Computing*.

Watt, S. (1999). The story between the lines: A thematic discussion of the experience of racism. *Journal of Counseling & Development*, 77, 54-61.

Winship, J. (2001). *The first step forward: IT literacy policy project*. Council of Australian University Directors of Information Technology (CAUDIT). Retrieved 7 April, 2004 from <http://www.caudit.edu.au/>