ICT in ITE: Undergraduate perceptions of emerging confidence and competence

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ABSTRACT

There has been relentless growth in the use of ICT within schools, universities and the workplace in recent years. This presents a challenge to users' confidence and competence. Primary schools are typical of this trend; as the curriculum has expanded in range, greater computer literacy is expected of student teachers from the outset of their courses. As an initial step, this study investigates the skills, experiences, attitudes, confidence and competence of a cohort of first year students. They were embarking on a four-year Bachelor of Education Honours degree course at university in order to qualify as primary and nursery school teachers. The survey suggested that the majority of students are suitably experienced, confident and highly motivated within a fairly narrow range of ICT skills but limited beyond those. Furthermore, most student teachers tend to underestimate the ICT abilities already displayed by many primary school children.

INTRODUCTION

This study investigates the current provision for ICT (Information and Communication Technologies) learning and teaching on the four-year undergraduate honours degree programme in Primary Education at the University of Edinburgh.

The results of this study mirror those of previous research which shows that student teachers need to be confident and competent users of ICT in order to effectively deliver ICT as an integral part of the primary curriculum (Ross *et al.* 1999; Cuckle *et al.* 2000; Mutton *et al.* 2006). As with previous research, this study concludes that, for this to be the case, ITE institutions need to foster student confidence and competence to appropriate levels (Allen, 1997 quoted in Fisher, 2000; Kay, 2007).

In addition to this, this study argues that fostering confidence and competence is best achieved by balancing two models (Preston *et al.* 2000 quoted in Becta, 2004; Franklin, 2007; Lambert *et al.* 2008): a permeation model where ICT is integrated across curriculum courses, thereby providing models for pedagogical use (Halpin, 1998 quoted in Fisher, 2000), and a skills model where students have the opportunity to develop ICT skills outwith a curriculum area context (Snoeyink & Ertmoor, 2001). Our findings suggest that the

relationship between experience, confidence, competence and expectation of pedagogical use is more complex than has been previously described.

BACKGROUND

ICT offers new opportunities and flexibilities but also challenges the confidence of users. Ironically, as technology proliferates, 'multiple digital divides' between teachers, students and pupils (Becta, 2001) are exacerbated. The term 'digital divide' largely refers to the disparity between individuals and communities who have possession of, access to, and employ ICT effectively, and those who do not (Becta, 2001).

It is now universally accepted that that new entrants to the teaching profession need to be confident, willing and enthusiastic users of ICT. Research also indicates a correlation between successful ICT usage and future academic success of pupils (Wheeler, 2005; HMIe, 2004).

Evidence that the ICT competency of those entering the profession has been rising (Simpson *et al.* 1998; Lambert, 2008) suggests the need for a refocusing away from teaching basic ICT skills and towards the pedagogy of ICT. Therefore, ITE courses need to unlock the potential of ICT within the classroom (Simpson *et al.* 1999).

Despite the apparent increase in computer literacy of students entering teacher education, a growing body of literature points to a disparity between student teachers' own ICT competence, on the one hand, and the ability of their institutions to prepare them to realise the potential of ICT in the classroom on the other (Murphy & Greenwood, 1998; Simpson *et al.* 1999; Cuckle *et al.* 2000; Beyerbach *et al.* 2001). Examination of the problem suggests that teacher education programmes provide limited preparation for a number of reasons including:

- student teachers' limited use of computers whilst at school (Cuckle *et al.* 2002 quoted in Becta, 2004);

- lack of integration of school-based work with university work (ibid);

- lack of integration of ICT in curriculum areas (Franklin, 2007);

- lack of regular practice time with new ICT skills (Rudd, 2007);

- lack of monitoring of use of ICT in school experience (Trushell *et al.* 1998);

- inability of university teaching staff to transfer new ICT skills into their courses (Simpson *et al.* 1999);

- inappropriate focus on the pedagogical use of ICT in the classroom (Fisher, 2000; Thompson *et al.* 2003 quoted in Kay, 2007);

- student confidence, attitude, expertise and organisational factors (Cuckle *et al.* 2000);

- lack of differentiated teaching to suit individual students needs (Yildirim, 2000).

Additionally, all of these researchers cite ways in which school placement experience does not enable students to employ ICT in their teaching practice. Factors that they identify as reasons for the under-utilisation of ICT in schools include the following:

- lack of staff development;

- lack of availability of ICT resources;

- lack of support from ICT developers and school administrators;

- classroom management issues;

- teachers' beliefs about the value of ICT;

- teachers being put off by technical problems; 'technophobia' (Bullock, 2004 quoted in Kay, 2007; Rudd, 2007), i.e. an adverse reaction to technology, possibly affecting half the population (Wheeler, 2005).

It can be concluded from this that the potential of ICT is yet to be fully realised in schools. The most difficult areas to address could lie with levels of confidence and attitudes to change, and the philosophies and perceptions that underlie teaching (Becta, 2004; Wheeler, 2005).

RESEARCH DESIGN

The study reported here will follow a cohort of students from the start of their four-year degree course beginning with an audit of their ICT experiences, skills, attitudes and perceptions. The initial survey was conducted in the autumn of 2005. A total of 116 incoming students completed questionnaires on their expectations of how frequently they would use ICT in their studies and their confidence or apprehension in facing the challenges of ICT. Other questions covered their access to and ownership of computers; patterns of usage of particular technologies at home, in study, work or recreational activities; their perceptions of the benefits and challenges of educational ICT use as well as background questions covering their age, gender and previous education.

After the survey analysis was completed a focus group of students, consisting of students differentiated on the basis of ICT experiences and skills, was formed to explore the issues arising both on the programme (contextualised ICT training using I-movie software within the Language 1[11] course) and then later following school placement (specific ICT tasks and sharing effective ICT practice in schools). Additionally, all students evaluated their experiences with I-movie.

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[11] The Language 1 course is undertaken by B.Ed Primary students in year 1 and addresses a variety of aspects of literacy across the four Language strands: reading, writing, talking and listening.

RESULTS

Experience

The survey showed that a significant majority of students either owned their own computer (69%) or had access within the family (22%). Approximately 25% were familiar with Apple Macintosh computers as well as PCs. Again, a significant majority (91%) had used ICT at least once a week over the preceding year, either in their work or studies, whilst just under half (47%) used a computer two or three times per week. More than a quarter (28%) used a computer daily. The most popular recreational uses of ICT were e-mail (92%), surfing websites (69%), downloading (e.g. music files - 63%) and ordering products on-line (59%). The most popular uses within an academic context were writing essays and assignments (94%), researching information for homework assignments (90%), revising for exams and tests (72%), or learning new material or information (54%). When an overall average is computed, it can be seen that ICT is used slightly more often for recreational use (46%) than for work use (41%). Both these figures are below the 62% average of students who were anticipating a greater use of ICT in the future compared with the recent past.

Students were presented with a list of eleven applications and asked to indicate which of those they used regularly (Table 1). The three facets of ICT, for which more confidence was expressed, were e-mail, the Internet and word-processing, significantly the same ones with which they had the most experience.

Table 1: Confidence and use of various applications (%)

	Confident	Need support	Never done	No response	Had done
Internet	91	6	0	3	97
Word-processing	90	7	0	3	97
E-mail	88	9	0	3	97
Spreadsheets	39	45	10	6	84
Powerpoint	37	37	21	5	74
Databases	32	54	8	6	86
Photoediting	15	34	46	6	48
Interactive Whiteboard	6	19	65	8	17
Web-design	3	15	77	6	48
Roamer turtle/Logo	2	15	73	10	25
Other	2	1	1	97	11
Mean	37	22	28	14	50

Attitudes

All the students expected to use ICT as regularly as two or three times a week in their university studies. 77% imagined they would be making daily use of

ICT. When embarking on their university course, 81% thought ICT would be 'very helpful' and the remainder 'helpful'.

Within those surveyed 36% indicated that they had some apprehension about the use of ICT on the course due to lack of experience. In fact only 16% were 'very confident' about using ICT (Table 2).

Table 2: Confidence in using ICT in university studies (%)

Very confident	16
Quite looking forward to the challenge	49
A little apprehensive	34
Very apprehensive	2

ICT skills and perceptions of pedagogical use

Students held significantly lower expectations of classroom use of certain technology items and applications (photo editing - 43%, Roamer Turtle/ Logo - 27% and web-design - 19%: Table 3) coupled with low confidence levels.

Although Powerpoint, spreadsheets, databases and Interactive Whiteboards carried medium to high expectations of use (88%, 65%, 65% and 85% respectively: Table 3) they were also coupled with lower confidence levels (37%, 39%, 32% and 6%: Table 1).

Table 3: Anticipated use in primary education (%)

Internet	98
Word-processing	98
E-mail	89
Powerpoint	88
Interactive Whiteboard	85
Databases	65
Spreadsheets	65
Photoediting	43
Roamer turtle/Logo	27
Web design	19
Other	12

DISCUSSION

The findings are discussed under three headings to highlight points emerging regarding student experience, attitudes and abilities relating to skills and pedagogies. The influence of these areas on effectiveness in teaching the ICT curriculum is a central issue in this research.

Experience

Findings suggest that over twice as many students are more likely to use their own computer for university studies than those with other forms of access. At least 25% of students had access and experience of both PC and Apple Macintosh computers. Cross-referenced variables suggest that students with

both PC and Apple Macintosh experience are twice as likely to express confidence as those only familiar with PCs. The survey indicated that students used computers frequently for a range of purposes. Almost half used a computer two or three times per week, with almost one third professing daily use in the year prior to their university studies. Findings also showed that the majority of students used computers regularly for a variety for reasons including recreation, university studies and work.

The issues of access/ownership, experience, confidence and competence are intrinsically linked and interrelated. On the one hand, the data suggest that greater access/ownership leads to more use. This is likely to help foster greater competence and confidence. On the other hand, the data suggest that the more confident the students are with technology the more likely they are use it, and the more they use it the more confidence and competence should grow.

These issues have been researched in a teaching context with similar results. It has been suggested that teachers' personal use of ICT is directly related to their confidence in using it in practice (Ross *et al.* 1999; Lambert *et al.* 2007). A further study confirms that those teachers who made little or no personal use of ICT had a low level of confidence in using it in their lessons (Cox *et al.* 1999 quoted in Becta, 2004).

Attitudes

The students surveyed appeared to have a very positive outlook, with the majority anticipating frequent use of ICT in their studies and perceiving that it will also be beneficial to them. Indeed more than 50% of students expressed confidence in their abilities to cope with the challenges ahead. Focus group students expressed a positive attitude in that they knew they would be required to use ICT and so were more disposed to trying ideas out independently. This early recognition of the potential of ICT is vital as a positive attitude at that stage is likely to foster engagement with technology (Cox *et al.* 1999 quoted in Becta, 2004; Sime & Priestley, 2005).

It appears to be the case that confidence and competence do not result simply from use. Belief in the value of ICT is also essential. Cross-referenced variables showed that the more often students used ICT the more likely they were to regard it as helpful for their studies. Even at this early stage in their degree programme the focus group displayed a very positive attitude to using ICT in the classroom. As a result of their work on the Language 1 course, they described and justified examples of effective use of ICT for enhancing learning and teaching. For example, they spoke with conviction about how ICT had the potential for encouraging collaborative learning and empowering young writers.

However, although more than 50% of students had a positive outlook, only 16% were very confident, with 36% showing apprehension about using ICT in their studies. This could be due to their lack of experience with technology but could also be explained by their increasing awareness of the demands of the Scottish curriculum guidance (Scottish Executive, 2000). Focus group participants stated that they were surprised at what the ICT curriculum

guidelines demand of pupils. The requirements of this curriculum range from basic computer literacy to more advanced skills such as web page design (ibid).

Additionally, the perception of ICT proficiency in children appears to be a negative influence on attitudes of new teachers. Findings by Condie *et al.* (2002) indicate that over a third of teachers found it disturbing that pupils knew more about ICT than they themselves did. In summary, the positive attitudes of novice, enthusiastic student teachers, and their related confidence and competence, may be undermined by the demands of the curriculum and the perceived expertise of pupils compared with their own technological expertise.

ICT skills and perceptions of pedagogical use
Our findings suggest that relationship between ICT experience, confidence, competence and expectation of pedagogical use is complex.

High expectations coupled with high levels of confidence were evident. The survey indicated that some ICT applications are used more regularly and confidently than others, e-mail, the Internet and word-processing being the most frequently cited examples. An explanation for this finding could be the increased recent use of these applications by students both at home and at school. This appears to reflect the point made by Fisher (2000), in the context of younger learners, that the rapid advancement of pupils' ICT skills over recent years is due to the rapid increase in the resourcing of the school curriculum.

High expectations coupled with lower levels of confidence were also identified. Although the data suggest that students have high expectations of pedagogical use of certain applications (Powerpoint, spreadsheets and databases), this is coupled with lower levels of confidence and personal use. Reasons for these findings could be that these applications, in comparison with those others listed, are perceived as both more advanced and used for more specific functions not requiring daily use. This point is supported by Cuckle *et al.* (2000) and Condie *et al.* (2002) who also found that less than half of their students used databases or spreadsheets for personal purposes. Nearly all of the students expected to use an Interactive Whiteboard but substantial lack of confidence was evident: for every user who expressed confidence with whiteboards there were more than three who needed support. One focus group student experienced an enthusiastic mentor teacher who had an Interactive Whiteboard but didn't take it out of its box therefore reinforcing apprehension and also complacency about pedagogical use.

Low expectations of pedagogical use of certain applications and low confidence levels were apparent. The items that students least expected to see in classroom practice (photo-editing, Roamer turtle/Logo and web-design) were the ones with which they had no experience and so low confidence levels. Focus group participants who reported that they had little or no knowledge and experience of items like Roamer turtle/Logo confirmed this finding. Our research also indicates that the availability of a range of newer applications, such as I-movie, continues to exacerbate the so-called 'digital divide' (Becta, 2001). None of the cohort of 150 students had used I-movie at the start of the programme. Evaluations of their work with this application indicate that many of

the students perceived it as complex, advanced and too difficult for young children. ICT was viewed as a challenge both in terms of technical knowledge as well as curriculum expectations: *"I wouldn't feel confident using I-movie as I still feel a bit lost myself"* (year 1 focus group student). There is a danger of complacency when lack of expectation of use is coupled with lack of experience and confidence. If students don't expect the application to be used and are apprehensive about it, then they may be less likely to be motivated to learn about its effective pedagogical use. This lack of knowledge, skills and experience in practice has been documented in previous studies (Murray, 1992; Conlon, 2004).

The main challenges to student teachers' effective pedagogical use of ICT were seen as issues of access and resources, training, confidence and technical knowledge. The best practice tends to be found where high quality resources are available (Mumtaz, 2000 quoted in Becta, 2004) but teachers' lack of knowledge can mean they are neither confident, competent, nor willing to use the technology available (Becta, 2005). Focus group participants made a direct link between lack of confidence and competence, and a lack of access to ICT in a pedagogical setting. They commented that they did not benefit from effective modelling of computer use in either school or university settings, leading to lack of confidence and competence. Training initiatives such as NOF[12] have attempted to address these deficits in schools with varying degrees of success. An important shortcoming was seen as the failure to provide differentiated learning experiences based on the prior knowledge of teachers (Conlon, 2004).

CONCLUSIONS AND RECOMMENDATIONS

The data presented here point to a strong correlation between student teachers' personal use of computers, their confidence and competence in ICT and their expectations in terms of its classroom use. Students who had high expectations of pedagogical ICT use also expressed more confidence with a range of applications. Students with more confidence tend to be those who are expecting to see more ICT use. Other research supports findings which suggest that, if student teachers can gain ICT knowledge and pedagogical skills, then their anxiety is likely to decrease (Gunter *et al.* 1998 quoted in Fisher, 2000; Brown & Warschauer, 2006 quoted in Lambert *et al.* 2008). These findings have implications for ITE providers and school partners with regard to addressing tensions between the development of ICT skills and pedagogical practices. Some frameworks for supporting students are advocated, including skills-based methods, a permeation approach, a balanced model, differentiated learning opportunities and school partnership. Each of these will now be considered.

The findings from the focus group in this study suggest that a skills-based approach might be a successful strategy to address the requirements of the

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[12] The 'New Opportunities Fund' programme of ICT training designed to develop teachers' levels of expertise in the use of technology in order to foster an increase in pupil achievement; £230 million was invested into this programme.

Scottish curriculum guidelines. There is also some evidence to support such an approach in relation to The National Curriculum in England. This requires a range of specialist types of knowledge and skills that teachers might lack (Waite, 2004; Taylor, 2004). Becta (2004) states that teachers whose skills base was inferior to that of their pupils are less willing to make use of ICT, leading to inconsistent learning and teaching. Regardless of levels of confidence and competence, focus group students felt that drop-in workshops on specific applications would facilitate their ICT knowledge and understanding and increase confidence. However, a disadvantage of a skills-based approach is that the teachers may treat an ICT curriculum as a set of skills that have to be taught in a linear, age-related manner (Condie *et al.* 2002).

The rationale of Scottish curriculum guidance, historically in the form of the 5-14 guidelines and presently in 'Curriculum for Excellence', is two-fold in that it advocates a skills component but also a permeated approach (Scottish Executive, 2000; Scottish Executive, 2009). Although this rationale is based on what is known about how young people learn, it could be argued that student teachers need the same learning opportunities. Simpson *et al.* (1998) suggest that student teachers' priorities lie in learning about the pedagogical use of ICT. Given the importance of pedagogy and the related experience, confidence and competence required of students to use ICT effectively, it has been argued that universities should pursue permeation models whereby ICT is an integral, embedded part of each aspect of the curriculum, rather than an add-on element (Franklin, 2007; Lambert *et al.* 2008). Others argue that courses need coverage of both pedagogical aspects and a skills element within a balanced model (Preston *et al.* 2000 quoted in Becta, 2004) in order to address the need for the development of both ICT skills and appropriate pedagogical practices. Perhaps more emphasis could be placed on 'less being more': using a narrower range of applications, but using them to their full power and potential, might be a better option than superficial coverage of a wider range of applications.

Conlon (2004) argues that, rather than a 'one size fits all' approach, teachers need a positive, differentiated approach to be motivated, confident and competent with applications and their pedagogical uses. The variation of student responses in the study reported here suggests that differentiated training is needed. However, this requires university staff to be more skilled as models of good practice (Simpson *et al.* 1999). This in turn raises the issue of specialist teaching; a dilemma remains as to whether to put more emphasis on enhancing the skills of the majority of tutors or make greater use of specialists. The courses surveyed in existing literature include specific, differentiated ICT skills training (Snoeyink & Ertmer, 2001) set in a permeated, problem-based learning approach (Simpson *et al.* 1998). Focus group participants suggested that provision should be differentiated to their needs in the form of drop-in skills workshops, ICT permeation throughout courses and the use of peer support, i.e. those with more knowledge and skills assisting those less informed students. A balanced model of skills and permeation has been used in the Language 1 course. Student evaluations indicated that they valued the opportunity to learn about a software application (I-Movie) within a context (World War II) as well as

having skills support in the form of instruction booklets and tutor support. They saw this as a valuable and motivational teaching and learning tool. Focus group participants commented they were keen to try out I-Movie in a relevant context on placement one. However, most overall student evaluations recommended that more time allocation for skills training, differentiated support and experimentation was required.

Avoiding a 'one size fits all' approach in favour of balance and differentiation is desirable, though it is commonplace to require a minimum, certified level of competence in ICT skills at the outset of a course. Whether these skills can be standardised for admission purposes is contentious (Cuckle *et al.* 2000). Elsewhere in Scotland there are university courses that use a Virtual Learning Environment (a software system designed to help with the management of educational courses; such systems facilitate online learning) to exemplify different applications across subjects. Students may be required to participate in group discussions and submit course assignments through the VLE. By using the VLE they become more confident and competent with the software and any associated applications such as Powerpoint presentations (Robertson, 2003).

A partnership between universities and schools is essential in providing models of effective practice for student teachers. Ideally there ought to be scope for matching students' needs in ICT to appropriate placement schools with differentiated training and resource opportunities. Although practical problems are likely to make this unrealistic, both universities and schools need to work in partnership to promote ICT use (Cuckle *et al.* 2000). One approach would be to give students appropriate tasks to complete whilst on placement, with appropriate supervision and assessment, to encourage them to reflect on and observe existing pedagogy with a view to informing their own practice. Our cohort of students was given such tasks and the findings will be discussed in a forthcoming paper.

The initial implementation of the above conclusions within the undergraduate programme has begun to tackle some of the barriers (Becta, 2004) that prevent new teachers from using ICT in their school placements and teaching career. A follow up study on student teachers' use, confidence and competence of ICT post year one school placement is now being carried out alongside a more in-depth analysis of their perceptions of the pedagogical use of ICT and evaluations of confidence and competence before and after a drop-in workshop on Interactive Whiteboards in order to identify any changes in attitudes, skills and perceptions. A central aim of this follow up study is to help this ITE institution ascertain how best to proceed with regard to provision of ICT education, particularly with regard to the tensions between the development of ICT skills and pedagogical practices, and how this might be addressed.

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