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### Why do some student teachers make very good use of ICT? An exploratory case study

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## **Why do some student teachers make very good use of ICT? An exploratory case study**

Michael Hammond\*, Sue Crosson, Elpiniki Fragkouli, Jennifer Ingram, Peter Johnston-Wilder, Sue Johnston-Wilder, Yvette Kingston, Melanie Pope and David Wray

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This paper reports the findings from a study of student teachers at a university–school initial teacher education partnership in England. Forty student teachers, on primary and secondary teacher education programmes, were identified through tutor and mentor reports as making very good use of information and communication technologies (ICT). These student teachers were interviewed, and in many cases observed, teaching a lesson using ICT. Interviews covered their use of ICT in a particular lesson; their past experience of using ICT; factors encouraging or discouraging their use of ICT in school; and their beliefs about teaching and learning. Observations recorded their uses of hardware and software. Findings indicate that access, support for, and modelling of, ICT use in the classroom were key issues in developing this very good use of ICT. Equally important, however, seemed to be the belief that ICT could make a positive difference to teaching and learning and a willingness to ‘learn by doing’. These findings are reported in the context of the wider literature.

**Keywords:** initial teacher education; ICT in school; pedagogy

### **Background**

This study sets out to explore why some student teachers make very good use of information and communication technologies (ICT) during their training. Perhaps not surprisingly, student teachers are often seen as having more recent experience of ICT and as being more committed to its use than longer serving teachers. However, it is also known from Teacher Development Agency (TDA) surveys in England that new teachers rate their preparation to use ICT less positively than other aspects of teaching, even though the position has been improving and should be seen in the context of a very positive general picture of teacher preparation (TDA, 2007). Much of the research carried out on teacher preparation to use ICT focuses on factors which encourage or discourage its use. These factors seem to coalesce around the themes of: the support given in school-based training; the input, where applicable, of higher education or other institutions with responsibility for training; the wider context of policy and expectations regarding teacher training; and the attributes of the student teacher himself or herself.

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***In-school support***

The role of the teacher responsible for overseeing in-school training is seen as crucial. These mentors, or supervising teachers, provide the expectations for student teachers' use of ICT (Cuckle, Clarke, & Jenkins, 2000; Summers & Easdown, 1996) and as Barton and Haydn (2006) suggest, student teachers are heavily influenced by the role models to whom they are exposed within a subject department. Loveless (1995) argues for a closer collaboration between mentors and tutors in defining the aims of the partnership regarding students' ICT training and for clearer guidelines and closer collaboration. Mutton, Mills, and McNicholl (2006) recommend that those supporting student teachers must be confident in ICT. If a mentor is not ICT confident then it is left to student teachers to take responsibility for their own development. The mentor can be seen as one very important link in a wider network of support, including technicians and other teachers, in a placement school. However, in some schools (Taylor, 2004) students will not encounter mentors or other teachers who model effective use of ICT. Taylor (2004) further stresses the importance of school-based observation of ICT lessons. Obviously access to ICT is a key issue in encouraging student teachers to use ICT (e.g. Murphy, 2000; Opie & Katsu, 2000; Selwood & Pilkington, 2005). However, without greater funding for schools and better provision of ICT, it is not surprising that some schools cannot provide this access (Opie & Katsu, 2000).

The general culture of the school is a further factor in the use of ICT and it is easier to develop the use of ICT in schools in which teachers and student teachers are encouraged to innovate (Almås & Nilsen, 2006; Summers & Easdown, 1996). Lawson and Comber (1999) see the commitment of the senior management to the use of ICT as an encouraging factor for student teachers – in contrast, a lack of vision (Almås & Nilsen, 2006) is a key restraint.

***Higher Education Institution (HEI) input***

HEI-based (and other) pre-service training is a further factor in the use of ICT by student teachers. For example formal training, perhaps in the form of hands-on workshops, involving group work (Barton & Haydn, 2006), or at a distance with multimedia support (Ertmer, Conklin, Lewandowski, & Osika, 2003), may be a means of opening student teachers to the possibilities which ICT offers. Structured reflection on the use of ICT can also be a powerful technique in developing pedagogic understanding (Almås & Nilsen, 2006; Selwood & Pilkington, 2005; Taylor, 2004). Both Taylor (2004) and Galanouli and McNair (2001) argue that assignments which relate ICT to developing practice can be influential.

***The wider context***

In many countries, teacher training standards often require evidence for the use of ICT but there is very little evidence of how this affects student teacher practice. In one study, online tests were often seen by student teachers as 'pointless' and a 'waste of time' and the requirement to provide documentary evidence for the use of ICT was of limited importance (Barton & Haydn, 2006).

***Attributes of the student teacher***

A key issue appears to be the pedagogical orientation of the student teacher. Taylor (2004), for example, suggests that the use of ICT develops with understanding of

teaching and learning in general. Those articulating the most sophisticated understanding about the use of ICT have generally transferred pedagogical principles learnt in other contexts. Self-efficacy – or ‘confidence to perform specific tasks’ – is seen by Albion (1999) as a factor in student teachers’ practice with ICT. Another factor often mentioned is the level of ICT skills possessed by the student teacher, although this is not as influential as might be expected (Albion, 1999). Rather it seems to be a general confidence in personal use and a belief that ICT can impact on pupils’ learning which really count (Barton & Haydn, 2006).

### **Recommendations**

Within the literature a wide range of recommendations for supporting student teachers have been made, including:

- The presence of ICT resources within ordinary teaching rooms.
- The provision of high-quality, powerful, and convincing examples of ICT use in subject teaching (Barton & Haydn, 2006; Galanouli & McNair, 2001) which go beyond ICT skills (Hughes, 2005) and link to the development of wider pedagogical knowledge.
- Differentiation of the training sessions required within a particular cohort (Haydn & Barton, 2007; Taylor, 2004).
- More well-defined, subject-centred work in ICT (Pritchard, 2001).
- More organised, active and directed help from mentors (Cuckle et al., 2000; Loveless, 1995). Mutton et al. (2006) suggest that mentoring could develop into a wider, more mutually reinforcing relationship between a student teacher and a mentor.
- Personal ownership of a laptop to improve ICT competence (Almås & Nilsen, 2006).

In the wider picture, student teachers *might* be more confident in using ICT than many qualified teachers but they might also see themselves as lacking knowledge and understanding about teaching and be particularly influenced by colleagues whose use of ICT might be rudimentary. A further complicating factor in understanding the use of ICT is its rapidly changing nature. ICT use is no longer considered as quite so esoteric an activity as it was in the 1990s when early research was carried out. A second major change has been the greater investment in ICT in schools, so that according to one survey (British Education Suppliers Association, 2007) nearly all schools have networked computers and are connected to the internet; pupil–computer ratios are becoming more favourable. Interactive whiteboards (IWBs) are installed in most schools (a mean of 7.4 per primary and 20.8 per secondary school is reported). Nonetheless the same survey shows access remains a problem for many teachers, particularly access to ICT rooms and for many to teaching rooms with IWBs.

### **The study**

This paper reports the first part of a project which identifies student teachers who make very good use of ICT and describes their use of ICT during their final placement and in their first year of teaching. Here we will report only on the data arising from the initial training experience. In the HEI–school partnership in which the study took place, primary and secondary student teachers took a one-year course in order to qualify for

teaching. They followed a mix of HEI-based training (58 days for secondary and 94 days for primary) plus placements in two different schools (128 days for secondary and 93 days for primary). They were assessed against a set of standards produced by the Teacher Training Agency (TTA), the forerunner of the TDA, which oversees teacher training and development in England (TTA, 2003a). The use of ICT to meet curriculum objectives was modelled in specialist sessions, all teaching rooms had IWBs and there were ICT skills support sessions for those requiring further specialist support. In partnership schools there was an expectation, supported by TTA requirements, that student teachers used ICT in their teaching and to support the learning of the pupils they had contact with.

### **Methodology**

The aim of this study was to address the very broad question of why some student teachers make very good use of ICT. This raised a set of sub-questions:

- What is very good use of ICT?
- What are these student teachers' prior experiences of using ICT?
- How do they use ICT? What factors encourage/discourage their use of ICT?
- How do they develop their knowledge and understanding of teaching?

The research was conducted within a qualitative tradition (see Miles & Huberman, 1994), in this case exploring the perspectives of student teachers, triangulated against observation and documentary data.

#### ***What is very good use of ICT?***

The study began with a broad definition of very good use, and noted the difficulties in using the term. Within the partnership it was felt that very good use of ICT involved: making varied use of ICT (e.g. with both teachers and pupils using ICT for learning); regular use of ICT (more than a lesson a week); and the ability to focus on the use of ICT to support subject teaching. The assessment of 'very good use of ICT' needed to make due allowance for the subject or phase for which the student teacher was being prepared and that, as beginners, some ICT use may be uneven in delivery and outcomes. Hence the ability to reflect on the use of ICT constituted another characteristic of the very good user. Very good users were identified within the partnership through the normal course of observation and teaching sessions over the main part of the academic year; through mentor reports and through summative assessments of teaching at the end of the first placement and the interim point of their second placement; and through assignments and portfolios produced during their training. The process of identifying student teachers for the sample was based on moderated best-fit judgements carried out as a normal part of assessment.

#### ***Constructing a sample***

By May 2007 62 student teachers (30 out of a primary cohort of 160 and 32 out of a secondary cohort of 260) had been identified as very good users of ICT. These teachers were broadly representative of the primary and secondary cohorts though contained a slightly higher proportion of males and a slightly lower proportion of

Table 1. Comparison of the sample to the cohort as a whole.

	Mean age (years)	Percentage ethnic minority	Percentage male
Secondary Sample	25.9	13.8	34.5
Secondary Cohort	26.8	18.7	31.3
Primary Sample	26.2	6.5	12.9
Primary Cohort	27.9	7.9	9.7

ethnic minority student teachers. Their mean age was just below that of the wider cohort (Table 1).

From these 62 student teachers a convenience sample of 40 was constructed which was broadly representative of the cohort (24 in the secondary phase to reflect the different subject cohorts and 16 in the primary phase). Active consent for participation was essential, as the study could be easily misconstrued as part of the student assessment process and the idea of school visits could result in unintended levels of stress for selected students. In the event, due to the tight timescale (there were only six weeks between the identification of students and the end of their school placement), 20 visits to school were made, with a further 20 interviews being conducted within the University. Table 2 shows the constitution of the sample by subject and age phase.

Observations of pupil and teacher activity were made and recorded against a time line. Interviews followed a schedule of open questions covering the use of ICT in a lesson; student teachers' past use of ICT; experience of ICT as a learner during their training; factors which encourage/discourage ICT use in school; and beliefs about teaching and learning. Where a lesson had not been observed the first part of the interview covered a recent lesson that the student teacher had taught. During the interviews documents were examined including lesson plans and lesson observations which showed past use of ICT.

The interviews were transcribed and comments aggregated (using NVivo software) around themes of: personal use of ICT (six sub-themes); a particular lesson (eight sub-themes); factors which encourage/discourage the use of ICT (nine sub-themes); beliefs about teaching and learning (six sub-themes). Data displays were constructed and used to support the descriptive reporting that follows in this paper. The data were then further contrasted and associations between the data explored.

Table 2. Breakdown of sample by secondary subject and age phase.

	Numbers visited	Numbers interviewed without a school visit	Total
Economics and business studies	2	2	4
English	2	1	3
History	2	0	2
ICT	1	1	2
Mathematics	2	1	3
Modern foreign languages	1	0	1
Science	1	6	7
Primary	9	9	18
Total	20	20	40

## Findings

The findings are organised into three main sections:

- What are student teachers' prior experiences of using ICT?
- How do student teachers use ICT?
- What factors encourage/discourage student teachers' use of ICT?

### *What are student teachers' prior experiences of using ICT?*

The student teachers in the sample had made widespread and frequent use of ICT before starting their training. More than half used computers as an everyday tool for personal and study purposes, for example they made frequent use of email, used mobile phones for texting, used social networking sites such as My Space and Facebook for contact with friends, and sometimes shopped online. They often referred to this kind of use as 'just normal', reinforcing the status of ICT as an everyday tool of choice. Nearly all had used ICT regularly to help in their past studies, for example to access journal article databases; to search for relevant websites; to access archives and resources prepared by lecturers. They regularly shared and exchanged resources using email. All used word processing for essay writing and PowerPoint for presentations.

Within the sample, just over 10% described a more restricted prior use of ICT, which focused on word processing and the use of the World Wide Web. However, they, too, were comfortable with the use of ICT. At the other end of the spectrum around a third of the sample described a more specialist use of ICT, for example learning to use packages such as SPSS or Photoshop for study and/or for work purposes, and a small number had a particularly strong ICT background, for example working at an ICT helpdesk or within a training department. Nearly all felt that ICT was helpful, if not essential, in their past study and this continued in their preparation for teaching. They used widely available ICT tools such as word processors, presentation software, the Web for note keeping, documentation, lesson planning, preparing resources, assignments, communications and so on. All but one had access to a computer with internet connections and email at home.

In describing their learning of ICT they very much relied on a hands-on approach involving trial and error: this was described as 'having a go', 'playing with it', 'trial and error', 'hit and miss', 'messaging about', 'fooling around', 'click some buttons and see how it works', 'sitting down and experimenting with it'. This resonated for many in the sample with their enjoyment of more learner-centred approaches in their first degree. Some had been able to employ 'hands-on' approaches to their study: for example, one participant had followed a media degree about which she commented: 'I guess I was always going out, filming, recording, interviewing, it was not like sitting in the lecture theatre for eight hours'.

### *How do student teachers use ICT?*

Student teachers were asked to discuss a lesson they had taught or, in half the cases, a lesson that had been observed. In neither case were they asked to present an exemplary lesson. Rather the aim was to provide a snapshot of uses to which ICT had been put. In every lesson, except one, a projector linked to an IWB was used to stimulate and reinforce whole-class teaching, for example to display PowerPoint presentations,

to display pupil work or to demonstrate ICT procedures. In most of these lessons some of the features unique to IWB were used, such as annotation tools, zoom tools, dragging and dropping of shapes and freehand writing onto a blank screen, which was stored for later access. In the majority of cases (26 out of the 40) pupils were asked to use software for themselves either working alone or in small groups. Widely used software included PowerPoint (four instances in primary and five in secondary); Web browsers (five primary and one secondary); Google Earth (two primary and two secondary); and spreadsheets (two primary and five secondary). PowerPoint was used both for teacher and pupil presentations. These presentations always included images and often sound and moving images (for example a short clip of animals hunting to begin an introduction to a lesson concerning the food chain). Web browsers were used in structured activity in which pupils were required to search for and, very often, transform information to other formats (for example satellite data were captured and used in a presentation on the weather). Google Earth was used to draw attention to features of the locality through interactive visual displays. Spreadsheets were used for information handling, for example to carry out repeated calculations and display data quickly. Other software mentioned included Logo (twice) and Photoshop; the graphing package Autograph; a word processor; a games produced within Little Fingers software. The floor turtle Beebots was used in one lesson. Most secondary lessons took place in an ICT room (a teaching room, equipped with a network of computers) which the student teacher needed to book. In primary schools, most lessons took place in everyday teaching rooms.

Student teachers were then asked about the planning of lessons. Here experiences were mixed, with some spending as little as 15 minutes to put together material while one had spent three or four hours collating multimedia resources for a lesson. Most spoke of spending one to two hours but this included thinking through the organisational and pedagogical issues. In some cases they had to learn to use new software or familiarise themselves with new networks.

#### *The rationale for using ICT: the wider picture*

Student teachers were asked about their rationale for using ICT in the lesson. This was explored in three ways: pupil reactions; rationale for using ICT; and ideas about good teaching.

First, student teachers were asked about pupil reactions to the use of ICT in the particular lesson being discussed. Here they made many more positive than negative observations. They strongly believed that pupils enjoyed using ICT (22 mentions in a question related to this); paid more attention to what they were learning (15 mentions); were more motivated (9). ICT also allowed pupils to work in a more 'active' fashion (6 mentions); by more active they meant involving 'hands-on' physical activity as well as offering greater control of learning through feedback at the machine. In contrast, few negative reactions were associated with the use of ICT, although some difficulties were raised in reflecting on the lesson. These included visibility for pupils further away from the IWB (1); pupils waiting to access equipment (1). Some (2) mentioned that the IWB had become 'the norm' in their school and pupils were now blasé about its use, and two felt that using the IWB made little difference to how the lesson was received. In talking about the lesson some referred to their own concerns as teachers. First amongst these were technical problems and their consciousness that the software or hardware might fail (3) or that children might break the equipment (1).



A few (3) referred to more pedagogical considerations and realised that pupils could go ‘off task’ or that they as teachers could ‘hide behind’ PowerPoint displays and at times talk for too long. As one put it, ‘I felt like a lecturer at Uni and I forgot that they are 11–12 years old in front of me and I think that can be a real problem’.

Second, they were asked about their rationale for using ICT in general. Their responses are presented as discrete categories (Table 3) although very often they appeared interconnected within the interview. For example, many spoke about the use of images and animation as a means of securing attention which would promote interest in a topic *and* enable clearer explanation of ideas and concepts. The distinction between pupil and teacher use of ICT was not as obvious to them as might be supposed. Very often they would describe how the IWB offered a mix of affective and cognitive support both to the teacher and to the pupil. In the same vein they did not see the IWB as a tool reserved for the teacher and sought at times to encourage pupils to talk at the board or, at least, to display examples of pupils’ work.

Student teachers were also asked about how the same lesson might be different if ICT had not been used. In some cases (for example the use of satellite data) it was difficult to envisage the comparison. In other cases the most frequent observation was that it would be more time-consuming both in planning (for example to create paper-based aids and extra support material) and in teaching (for example to write information on the whiteboard), and in pupil activity (for example in labour-intensive tasks such as calculating and drawing).

Table 3. Rationales suggested by student teachers for using ICT in a particular lesson (more than one rationale was mentioned by some).

Rationale	Mentioned	Examples included....
Gains attention of pupils	12	the use of the IWB as visually appealing and interactive presentations which created interest and offered visual support for explanations; rationale for use was often associated with visual/auditory/kinaesthetic learning styles
Use of images and animation	10	presentations and some authoring of multimedia described
Labour-saving/ difficult to do otherwise	9	using Beebots, carrying out web quests and information searching in general
Use of video clips	5	accessing previous board work on IWB; access to pre-prepared presentations; access to Virtual Learning Environment resources
More active learning	5	up-to-date business news stories on the internet; satellite images; news stories within target language sites
Storage	4	re-fashioning images for audience; revising texts in response to feedback (closely tied to arguments about labour saving)
Access to up-to-date source material	4	sharing of equipment and shared overhead display seen as support for collaboration
Editable	3	referential learning in cases in which ICT was being taught as a subject
Helps pupils share work	2	
Learning about ICT	2	

Third, the student teachers' rationale for using ICT was compared to their wider views on what they would expect to see in a good lesson they had taught. Student teachers believed that pupils needed to be taking part actively in order to learn and rated interactivity and engagement very highly (Table 4). Indeed, these features were also cited the most frequently when the student teachers asked how they themselves liked to learn and how they had best learnt to teach. For the latter question, they separated out their own preferences from teaching approaches that they imagined their pupils would prefer. Further key factors were the motivation and interest of the learners; differentiation; and pupil autonomy. Student teachers clearly recognised that effective pedagogy was focused on pupils' needs and interests. However, the role of the teacher was seen as important in this. He or she might set a 'starter', should frame the activity, and, crucially, should bring 'clarity'. By clarity they believed that the teacher should set out the aims of the lesson and monitor progress towards those aims – pupils need to know what they are going to learn, what they are expected to do, why they are expected to do it and how far they have reached those expectations.

The association between the rationale for using ICT and the idea of a good lesson was clear. For example, the use of the IWB for interactive, visually stimulating presentations was very valuable as it was also accepted that whole-class explaining and modelling of an activity was central to good teaching. Similarly, access to up-to-date material over the Web was valuable if relevance and topicality were considered important. At the same time, the attributes of good teaching were not dependent on the use of ICT and when student teachers were asked to talk about a recent lesson they were proud of, less than half referred to one using ICT. Common to all these lessons, however, was that they had engaged children through their topicality and/or their relevance to pupils. Very often pupils were involved in creating an artefact or a piece of writing which had some personal meaning for them, and often this involved some physical activity such as taking part in a science experiment, creating a booklet, playing a musical instrument, making puppets from paper and glue or filming and editing images. They were 'hands on' in the widest sense. This very much confirmed that ICT was seen as another means of promoting pupil learning.

Table 4. Features of a good lesson as seen by the student teachers.

What makes a good lesson?	Number of 'mentions' (references)	Number of participants who mentioned this (sources)
Clarity	19	18
Interactivity/active learning	14	14
Motivation/interest/enjoyment	12	12
Differentiation	12	11
Engagement and relevance	11	11
Starter activity	8	8
Autonomy (pupil)	7	7
Variety of activity	7	7
ICT	3	3
Modelling	1	1

*What factors encourage/discourage student teachers' use of ICT?*

This analysis suggests that the key factor influencing student teachers' decisions to use ICT was a belief that such use made a difference to their lessons and that pupils would respond positively to it. However they raised several further issues which were influential in helping or hindering them in particular lessons.

The key factor here was, unsurprisingly, access to ICT (see Table 5). They had regular access to ICT at their University and in some cases had been loaned tablet PCs and other portables for personal use. Access at home was seen as essential to enable the preparation of resources and to run through ICT procedures in advance of teaching. In school the majority of student teachers had access to IWBs in their teaching rooms, but had to book class sets of laptops or computer rooms in advance. In some cases this required considerable foresight as one noted, 'If you want the children to use the computers in the ICT room you have to book three weeks in advance so that is not easy'. In discussing an ideal environment in which to develop their use of ICT, all prioritised having access to sufficient machines. They were aware of different levels of access either at first hand, by comparing their own two placements, or by talking with their peers. In one example, a student teacher talked about having to wait to use a school laptop while the class teacher used it for registration of pupils. This made it impossible to set up a lesson in advance and created extra stress. Another spoke about collecting ICT resources from the University as they were missing in school. In contrast, the two specialist ICT student teachers took it for granted that they would be teaching in a room with a network of computers and some primary teachers were timetabled in advance by their school to use the ICT room.

Mentor and tutor input was seen by student teachers as important in modelling the use of ICT and raising their awareness of different types of use. They felt that this had been done as comprehensively as time allowed in the University and they gave examples of some particularly effective sessions. They equally valued the input of their peers, for example in sharing resources through conferencing software and in troubleshooting problems. In school, mentors, and other colleagues with whom they shared classes, were very influential though again there was a wide range of experience. Some spoke about the encouragement of 'seeing other people do it. A lot of the lessons that involved ICT were some of the best lessons so I picked up from that'. Some, on the other hand, felt held back. 'When I was observing them they didn't really use ICT. So at the beginning I was a bit reluctant to use it because I thought that maybe they didn't want me to use it in their class'.

Time was another frequently mentioned factor, though it was almost as likely to be seen as a factor discouraging use as encouraging it. It often took longer to prepare a lesson using ICT, both to collect resources and to become familiar with new software. 'I know there is new software but I haven't got the time to try it out and familiarise myself with it'. Conversely, it sometimes took less time to plan lessons using ICT, and there was a wide availability of resources on the internet: 'you could see what 10 different other teachers had done and use one of theirs and it's great and you save lots of time'. There were efficiency gains as lesson plans and presentations could be saved and reused, after appropriate editing, with different classes or later with the same class. ICT thus could be time saving in teaching but setting up equipment at the start of lessons could be a difficulty. As one student teacher put it, 'it's nice to start the lesson with something that will catch their attention like a shark eating a seal, that's quite dramatic. But watching the teacher plugging wires, that's less dramatic'.

Table 5. Factors which encourage/discourage the use of ICT in school.

Encouraging/discouraging factors	Encouraging use		Discouraging use	
	References	Sources	References	Sources
Access to hardware or software	39	33	10	6
Personal experience and familiarity with computers	27	23	1	1
Mentors and other teachers in school	24	20	11	9
Time	18	14	27	12
University tutors	16	15	3	3
Peers	7	7	0	0
Timetabled to use ICT	7	6	2	1
ICT standards	4	3	0	0

Other considerations were rarely mentioned. For example pupils' existing ICT skills were often taken for granted in secondary schools or at least it was assumed that pupils were comfortable with using machines, were familiar with general-purpose software and could learn new features or new software quite quickly. Primary teachers made fewer assumptions but had more opportunities to get to know their classes better and could often observe an ICT lesson in a computer room. Only three commented on the standards against which they were to be assessed as having any impact on their use of ICT.

#### *Encouraging and discouraging the use of ICT: the wider picture*

Nearly all the student teachers felt that it was 'relatively easy' for them to develop ICT knowledge and skills during their programme, notwithstanding the difficult access that some faced. Hence they were more likely to mention factors which encourage ICT use rather than discourage it when discussing the teaching environment. However, this must be seen in a wider context in which student teachers took responsibility for their learning; were often resilient in seeking solutions or overcoming difficulties; and believed they would learn from experience. Indeed in discussing their own professional development they put the experience of the classroom at centre stage. As one put it, 'There are few ways to learn. One is just getting into it, just practising, getting in front of them, seeing how things work and then evaluate them'. However, they also valued strategies such as asking, watching and observing others. They were willing to take risks in learning to teach. For example in talking about learning to use ICT one student teacher compared his attitude with others: 'I think we all must have an experience [of ICT] before. They are all postgraduate, they must have used it in their careers or in their university. It should not really hold them back. What holds them back is their willingness to try things'. And another observed, 'The thing is that I'm not scared. I jump in and try things out. But many teachers are afraid of breaking things, especially with the computers'.

#### **Discussion**

The overarching question raised in this study is 'why do some student teachers make very good use of ICT?' This raised the initial question of how to define very good use.

At the start of the study very good use was defined in relation to frequency, variety of use and role for meeting objectives as interpreted by tutors and mentors within the partnership. Very good users could reflect on the contribution of ICT and this contribution was explained (Table 3) in terms of its ability to engage learners. This has very strong echoes in the *Harnessing Technology* document produced by the Department for Education and Skills (now Department for Children, Schools and Families), the government department responsible for education in England (DfES, 2005). The student teachers associated engagement with specific features of ICT such as storage, communication, provisionality, automatic functions, and interactivity and this again has echoes of an earlier document for teacher training in England (Department for Education and Employment, 1998). However, this study goes further than these two policy documents by making a much clearer association between very good use of ICT and very good teaching. All very good users of ICT were seen as very good in most other respects of the standards towards which they were working. Indeed conceptually it became difficult to imagine very good use of ICT without seeing very good teaching, though not vice versa. Hence, evaluating the use of ICT carried a judgement about teaching and learning in its wider context. Not surprisingly, this wider context was informed by models of teaching to which they were exposed and resonated with professional advice such as that given by the TTA (2003b) and by DfES itself (2004). In these models the teacher is expected to be sensitive to learners' needs and interests and provide opportunities for learners to take responsibility, but he or she is also expected to explain, model, use question-and-answer and carry out 'interactive whole-class teaching'. ICT was seen as contributing towards what has become a mainstream professional idea of 'good teaching'. As such, ICT was evaluated in the context of what went on in the classroom; student teachers were not interested in proxy measures such as raising or meeting standards. Implicit here is that their use of ICT contributed to a growing sense of professional identity (Day, Kington, Stobart, & Sammons, 2006) which transcends local conditions and personal preferences. This leaves a picture of ICT use which contrasts with a techno-romantic tradition (see Reynolds, Treharne, & Tripp, 2003) in which ICT has been seen as a tool which has been welcomed into school to support teaching and learning only to radically change the nature of teaching and learning. In fact, such high expectations invariably end in disappointment (Agalianos, Noss, & Whitty, 2001).

Why, then, did these student teachers make very good use of ICT? The study uncovered factors encouraging very good use of ICT. First amongst these was access, which can be described as a necessary condition. As discussed in earlier literature (e.g. Murphy, 2000; Opie & Katsu, 2000; Selwood & Pilkington, 2005) student teachers need access to ICT in order to use ICT and they need to use ICT in order to become good users of ICT. Looking further, it was noticeable that student teachers who were timetabled to teach within an ICT room simply expected to use ICT as did those with an IWB in their teaching rooms.

Second, a strongly influential factor in this study (as in other studies such as Barton & Haydn, 2006; Mutton et al., 2006) was the use of ICT by others. In school these others included mentors, other teachers and, sometimes, student teachers; at university, others included tutors and peers. Others were influential in raising expectations to use ICT; extending awareness of ICT use; modelling examples of ICT use; and offering feedback on ICT use.

A further important contextual factor was extended personal experience of using ICT. This gave student teachers the confidence to use ICT, allowed them to develop

effective strategies for learning new skills and gave them an awareness of the value of ICT based on its application in their own learning. However, ICT skills were not simply transferable to the classroom. All these student teachers had, for example, to learn to use the IWB, but texting and social network sites, both of which student teachers had used extensively, were rarely, if at all, used in school. Nor did personal experience give them the pedagogical rationale for using ICT. However, such experience did provide them with what could be called an inclination to use ICT or a propensity to see ICT as of value. This would seem to be of much greater importance than acquisition of a specific set of ICT skills.

These factors helped make very good use of ICT possible but they operated differently in different contexts. For example, there were varying levels of access, encouragement and technical support in the classroom and ICT use seemed easier to organise in dedicated ICT rooms. However, the environment was as ever interpreted subjectively, or, as put persuasively by Hargreaves, phenomenologically (Hargreaves, 1994). Student teachers were often aware that the same context might be off-putting to others less ready to use ICT. They overcame difficulties as they felt ICT could make a difference and overwhelmingly they felt that it had done so. One reason for this perception was that it made a difference to the aspects of their teaching (such as offering greater clarity and greater motivation) which were highly important to them. ICT could help them in achieving the goals they set themselves as teachers and in becoming the kind of teachers they wanted to be. Hence, the study has shown that becoming a very good user of ICT is not something 'done to you' but something that you do, albeit strongly influenced by environmental factors. This is an idea that has some resonance with earlier research which looks at personal factors when considering in-service teachers who are seen as exemplary users of ICT (such as Becker, 1994; Becker & Riel, 2000). However, the present study goes further and looks at the development of very good use of ICT in a more ecological manner; it is not the student teacher and it is not the environment, it is the interaction of the two. This line of argument is reinforced by research on new teachers carried out by Slaouti and Barton (2007) who point to the 'interdependence' of the individual and others; of the individual and systems; and of the individual and facilities. If this is correct, the recommendations given earlier concerning access, including personal ownership; the provision of clear, context-rich exemplification; and the support by mentors are all important in developing the use of ICT. However, the study points to the responsibility, or to put it another way acknowledges the achievement, of the student teacher himself or herself. In a wider context it suggests that learning to teach, and learning to teach well, can be considered not only as an apprenticeship, a kind of induction into a community of practice, but a more proactive process in which the student teacher is negotiating a practice within an environment which encourages some activities and discourages others.

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### **Notes on contributors**

The authors all contribute to programmes of initial teacher education at primary education and secondary subject level.

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