

ICTs: Teachers' and students' preconceptions and the implications for present and future teacher education

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This paper reports upon recent findings from research into perspectives of ICT within formal education in England and Wales and is part of a sixteen year longitudinal study in this area by the authors. From earlier studies undertaken [1-3] we expected teachers and students to hold a number of informal perspectives, and this paper refers to a research project established to explore these, to identify commonalities and differences, and to determine the implications for initial and continuing teacher education. The focus at this stage of our investigation is on recently trained teachers. We also discuss how the learner's and teacher's perspectives relate to the dominant political view. This holds that ICT is critical and at worst intrinsically neutral but generally beneficent, and that competence in using ICT across the whole population is vital for economic survival; as conveyed by politicians over the last thirty years.

Keywords teacher education; ICT perceptions

1. Introduction

The development of ICT (Information and Communications Technology) capability has been a component of the statutory National Curriculum in England and Wales since 1990. This stated that all learners in maintained schools aged between 5 to 16 are required to be taught specific skills, knowledge and understanding of ICT through published Programmes of Study, and to be assessed formally on their progress at the end of each Key Stage against defined Levels of Attainment. The rationale for ICT in the National Curriculum is detailed by the Department for Education and Employment [4] who define ICT both in terms of the experience of learners and also with reference to the technology. The political moment has been increased since 1997 with the publication of a number of government reports such as Department for Education and Employment [5], Department for Education and Skills, [6a, 6b] and, in secondary education, the Key Stage 3 National Strategy for ICT. This has the target of 85% of all pupils to reach National Curriculum attainment level 5 at 14 years of age by 2007 [7]. In addition the standards for the award of Qualified Teacher status [8] include the requirements that teacher education students demonstrate the effective use of ICT 'both to teach their subject and to support their wider professional role' (statement 2.5, p8), that student teachers 'use ICT effectively in their teaching' (statement 3.3.10 p12) as well as requiring success in the ICT skills test before graduation.

There exists then, a clearly defined and politically approved view of ICT in education in England and Wales. There are of course, additionally, a number of definitions published by various organisations and authors [for examples see: 9-11]. In studies already undertaken [1-3] we have found, not surprisingly, teachers and students holding their own informal perspectives on ICT. This paper refers to a study seeking to explore these views, attempting to identify commonalities and differences, and to determine the implications for initial and continuing teacher education. We are particularly interested, in the light of Rosalind Driver's alternative frameworks of teachers and learners in science [12], in the existence of a learner's and a somewhat different teachers' paradigm, and the characteristics of each.

The dominant political view holds that ICT is socio-economically critical and intrinsically beneficent. Competence in using ICT across the whole population is considered vital for economic survival and for

educational success; as presented by politicians for over thirty years, and recently by UK Prime Minister Blair:

“Two thirds of the country has access to the internet. Millions of people are ordering flights or books or other goods online, they are talking to their friends online, downloading music, all of it when they want to, not when the shop or office is open. The Google generation has moved beyond the idea of 9 to 5, closed on weekends and Bank Holidays. Today’s technology is profoundly empowering.” [13]

Previously in 2002, the then UK Secretary of State for Education and Skills stated:

“I think ICT is our DNA – it’s our internal combustion engine. It is the trigger that can bring about a revolution in how we teach and how pupils learn .. It’s actually the thing that can change, and change for ever, how we teach children and how teachers do their job.” [14]

This is typical of the rhetoric on ICT in schools which remains fixed within the dubious political perspective on the *information society*, unchanged for thirty years [see critiques by: 15-19] It also tends to ‘service’ a socio-economic model with the needs of educational ICT following the perceived current needs of industry. This view is not necessarily shared in industry itself, for example the British Computer Society lists ‘Communication; Approach to learning; Personal qualities, Team work, Self-organisation; Problem solving; Experience’ as well as ‘Specific knowledge and skills’ .as ‘Skills required by industry in the coming workforce’ [20]. The dominant government perspective on ICT also has little or no reference to pupils’ views of their own ‘world’. This raises pedagogic issues in the light of, for example, Ausubel’s *subsumptive learning* [21] which emphasises the importance of taking account of a learner’s preconceptions in introducing new concepts. It has long been a feature of the advice given to student teachers in preparing to teach that they make sure they know their pupils’ relevant previous experience and to be aware of their interests, values and ‘frames of reference’ and to build on these when managing learning.

Responding to these issues our earlier research aimed to discover what a range of teachers and learners understood by the term ICT [3]. In this we asked teachers not only to identify features of ICT they personally considered appropriate, but also to identify those they would expect their students to identify. In order to further this we have extended the depth of enquiry relating to the learners and focussed upon probationary and recently qualified teachers.

This paper presents the results of this study, detailing the perspectives of the students and relating these, in particular, to situated and socially shared understandings and misunderstandings, connotation, modality and the mediating role of teachers in supporting an effective, authentic and responsible ICT paradigm. In conclusion we will raise issues for initial and continuing teacher educators in terms of the context of the England and Wales education system in particular the Key Stage 3 National Strategy for ICT.

2. Background

In Clare and Backwell [3] , we describe a study undertaken using questionnaires with 314 year 10 pupils (14-15 years), 48 of their teachers and 36 student teachers. This forms part of a larger longitudinal work started in 1990 and continuing to 2007. The study was seeking to determine the perspectives on ICT held by each of the three categories of subjects, attempting to derive a working definition applicable to each group and comparing these. The results indicated a number of possible trends:

‘The expectations of teachers’ and student teachers’ definitions of ICT thought to be held by students were very different from their own in terms of scope. In addition, they differ considerably from the students’.. There is some indication of underestimating students’

understanding of the range and variety of ICT, and at the same time maintaining the very broad definition apparently held by their teachers. Although there is a core of common items selected, many more within students', student teachers' and teachers' definitions are not common across all groups' [3]

The study described below builds on this, attempting specifically to detail the preconceptions of recently trained teachers through a more illuminating approach. This seeks particularly, to explore further the meanings they have for ICT.

3. Methodology

Three year 10 teaching groups (aged between 14 and 15 years), of mixed ability/mixed gender, were selected in the pilot school, together with seven members of the teaching staff whose duties included teaching ICT. The former group (year 10 learners) though briefly described here, will be reported on at a later stage. The year 10 learners were asked to construct a concept map detailing what they considered to be associated with ICT (further detail on this research methodology is described in the ImpaCT2 evaluation report [22]). In addition, they were asked to identify features of ICT they considered appropriate from a revised list based upon that used in Clare and Backwell [3] - this exercise was followed by a whole group discussion on the thinking behind some of their responses.

A fully structured interview, as defined by Robson [23] was used with six of the seven teachers. Prior to the interview date, the subjects were provided with a synopsis outlining the nature, rationale and purpose of the study and all were asked during the interview if they had read it. The prepared interview schedule was derived from the questionnaire described in Clare and Backwell [3] but allowed for more open responses. As well as factual questions about the subject, key research questions were included (see Tables 1 and 2). The prepared schedule was saved in the form of a Microsoft Excel table. The interview was conducted with a pre-printed grid visible to the interviewer and the subject throughout, and responses to the interview questions were entered on this by the interviewer with the subject. The notes contained within the grid were carefully read through by the subject during and after the session and a copy made and left with subject. The interviews were conducted in privacy and in the subjects' school. To attempt further to elicit details of the subjects' perspectives on ICT, they were asked to complete an ICT features analysis (similar to the task given to the year 10 learners) based upon their own views and on how they perceived typical 14-15 year olds would respond.

4. Results

Seven subjects were involved in the study, all teaching at the same school, five of whom with a year or less qualified teaching experience. Of these, three were women and four men; five were trained in secondary ICT, one in Business Education (with considerable experience in the use of ICT) and one in Design and Technology (the latter having some experience of ICT). The profiles are shown in Table 1 (note that subject #7 was not interviewed). The interview sessions lasted between 15 and 25 minutes and all took place on the same day. The responses are summarised in Table 2 (from data taken from completed interview schedules and transcriptions of verbal comments at the same time).

Table 1 Profiles of subjects involved in study

	#1	#2	#3	#4	#5	#6	#7
Gender	Female	Male	Male	Male	Male	Female	Female
Years with QTS*	1	7	3	NQT*	NQT*	1	1
Specialism	ICT	Bus. Ed	ICT	ICT	ICT	ICT	D&T
Interviewed?	Yes	Yes	Yes	Yes	Yes	Yes	No

*QTS: Qualified Teacher Status

*NQT: Newly Qualified Teacher

5. Analysis

In their responses to interview questions the subjects, individually and as a whole, presented a perspective on ICT that was limited in scope to computers/microprocessors and communications technologies. This is very different from the responses in the questionnaire-based approach used in the earlier study where student teachers provided a very widely ranging view of ICT when prompted with a list. Having discussed the definition given in the interview, most subjects provided a wider range of examples of ICT than their earlier answers would have suggested though only marginally closer to the responses in the earlier study. This was however extremely confused including examples of hardware, media, software, applications and comments. Only one subject was consistent in his responses. The responses to the questions focussing on expectations of year 10 students were all very limited in their range, all expecting the broader connotations of communications technology to be problematic. This is entirely in line with the view expressed in the earlier study where 'pupils' understanding of a range and variety of ICT was similarly described.

With such a small sample and although a qualitative approach was employed the results should be dealt with great caution. Similarly comparisons with the previous study can be no more than tentative in the light of differences in student teachers involved, in terms of training programme, age and experience.

Table 2 Teacher responses during scheduled interview sessions

Questions	Typical responses
1 - What do you consider to be the key elements of a definition of the term ICT relevant now in 2006?	knowing how to use a computer; MS Office; Communicate information using present/current technology.
2 - How do you think this definition has changed over the last 10 years (if at all)?	Previous focus was on use and building of computers; move from programming and building systems toward 'communication' ; shift from a 'business use' perception to more of a games/leisure/fun use.
3 - What to you are unambiguous examples of ICT?	Computer hardware; software generally ; MS Office; internet; computer security; traffic lights; digital devices; shop till; traffic lights; automatic barriers; (1 - Not software);
4 - Would you consider any of these to be problematic to a typical Year 10 student? Explain.	ipod; mp3 players; shop till; traffic lights; automatic barriers; mobile phones; "they wouldn't view these as anything to do with ICT". All things found in a 'computer room' they would associate with ICT, all else would be problematic.
5 - What would expect a typical Year 10 student to mean by the term ICT?	boring coursework; computers; 50%/75%/most wouldn't know what the term ICT stood for - the rest would see it was about using a computer
6 - What is your opinion of the 'J. Mansell et al' definition of ICT? [10]	Outdated - must talk about communication; Too restrictive - it states things to be done 'electronically' without any reference to 'how'; I rate this very highly as a good definition
7 - What would you add or remove from this definition to better align it with current practice?	Would add communication; globalisation; Change data to information and acquisition to gathering. Also, 'electronic means' to 'using current technologies'; Most suggested removing nothing.
Final comments on ICT in schools:	'Year 10's would say "What has ICT got to do with anything?"' ; " They (learners) see ICT solely for entertainment and don't see it having a serious role"

Conclusions

The study described in this paper was intended to investigate further the notion of a teachers' paradigm for ICT, in this case, recently qualified teachers. The results, remaining aware of their limitations, prompt questions about the apparent breadth of the teachers' own scope of examples of ICT indicated in our earlier study. Here this was confirmed where prompts were given but where these teachers were asked to define ICT without these, a very restricted, but common, perspective was found. Indications concerning the expectations of a learners' perspective were more restricted and echoed the conclusions of our earlier work.

Where we intend to educate learners in ICT, that is to teach the knowledge, skills and understandings in its uses and to develop a critical and analytical perspective on the applications and implications of related technologies, it is vital that this is *meaningful* to pupils. In Ausubel's terms this requires that new material has a perceived relationship to what is already known and understood. Teachers, particularly those recently qualified, need to be aware of their students' perspectives so that learning is presented in authentic contexts relating to pupils' understandings of ICT. The studies we have undertaken cast some doubt on an assumption that teachers share with their pupils, a concept of ICT and its connotations, signs and language. The work of Driver [12] in science education and other investigators, and our experience in working with teachers and student teachers add some weight to this opinion. All teachers should be encouraged to critically assess their own preconceptions of ICT, to derive an informed and coherent definition of ICT and articulate a personal rationale for ICT education. They should be in a position to judge their pupils' understandings and experiences of ICT and use that as a starting point for planning their teaching and for planning for learning, avoiding restricting the pupils' domain with their own preconceptions. In secondary schools there are significant political and pragmatic pressures which may oppose this. Opportunities may exist through observations, for teachers to investigate the issues raised in this study and to evaluate the pupils' ICT work in the terms described above.

We feel more work in this area would be valuable; issues raised in this and earlier studies indicate a misjudgement of pupils' understanding of ICT leading to the use of false assumptions in planning for teaching ICT. This is further complicated by the very dynamic nature of educational ICT where the technology changes significantly within five years and the half life of relevant knowledge is variously estimated at from 2 to 5 years; emphasising the need for authentic approaches.

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