5 What teachers think about ICT

Background

The first survey had shown a significant number of students using a computer at home. This number increased with every survey, so that by the 1999 survey ownership ranged from 77% in Year 7 to 85% in Year 12/13. 81% of the school had a PC at home that they used for work, information and leisure.

Surveys into student computer use had been extended to teaching staff on each occasion. Teacher use of computers had consistently been below that of students, both in terms of the range of applications and the amount of time spent using computers. Factors leading to this have been identified as the problems of integrating IT activities into the prescriptions of the National Curriculum and difficulties in managing the learning environment of a computer-resourced classroom. The range of computer systems cited by teachers were predominantly those to be found in schools (see Table 18). When ownership of computers was examined, many teachers commented on the high cost of PCs as a proportion of taxed income. There was also an unwillingness on the part of some teachers to purchase something that would only lead to them producing more work in their own time. Despite these reservations most teachers expressed the view that there were benefits for students using them.

It was decided to extend the survey beyond the staff at Boston Spa Comprehensive School to identify teacher ownership of and attitudes towards computers and their use for schoolwork.

Methodology

During the academic year 1996/7 a sample of teachers in the Leeds L.E.A. was surveyed to identify their perception of the impact of computers on students' work. The survey was carried out at Boston Spa Comprehensive School, (BSCS) City Comprehensive School (CCS) and an L.E.A. professional development centre (PDC).

The scope of, and background to, the sample is as follows. Number of respondents: BSCS=61; CCS=24; PDC=31. Teachers were asked whether they had a home computer and, if so, what type it was and the purpose for which it was used.

Table 5.1: 1996/97 Teachers and computers: overall ownership patterns

PC	Acorn	BBC	Mac	Amiga	Atari	Psion
58%	20%	1.7%	3.4%	0.9%	0.9%	0.9%

Figure 5.1: 1996/7 Teachers and computers: ownership by type
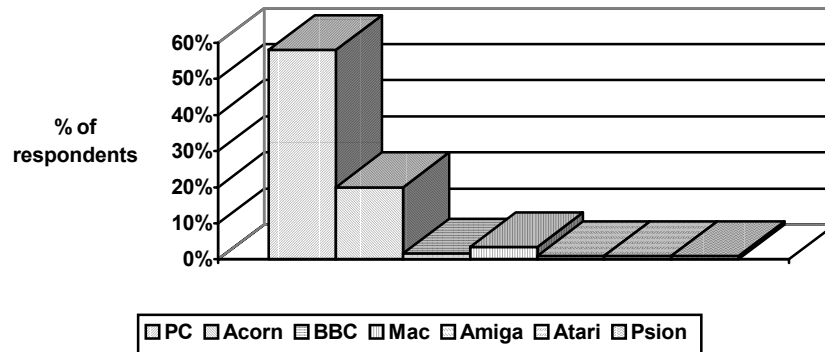
Although, by 1997, a PC running a Windows operating system had become the de facto standard for personal computing, it is significant than 20% of teachers owned and used an Acorn computer: either an Archimedes, or the older BBC Acorn. Many schools within Leeds LEA were still equipped with Acorn Archimedes, and their forerunners. Very few schools, on the other hand, used Apple Macintosh computers, compared with art colleges.

Responses to the survey

1. *What do you feel has been the main impact of computers on students' work?*

Table 5.2: Impact of computers on student work

Impact	All (n=116)
Presentation	37%
Motivation	17%
CD-ROM Research	10%
Word-processing	4%
Project work - documents	3%
Computer Literacy	1.7%
Control Technology	1.7%
Integration of syllabus topics	1.7%
Understanding of concepts	1.7%
Computer as an extra tool	0.86%
Drafting to improve content	0.86%
Statistical modelling	0.86%
Variety of teaching styles	0.86%

Whilst some teachers failed to respond to this question, others cited more than one area in which they felt computer use had benefited student work. Teachers across all subject disciplines noted the effect of computers on the presentation of student work: more specific comments tended to be related to the curricular area for which the teacher had responsibility. This also applies to responses to Question 3. (Question 5 examines negative effects of computers on student work.)

2. Do you feel the quality of the work has been improved by the use of computers?

Yes = 80%   No = 16%   No response = 4%

3. What aspects of students' work has been improved by the use of computers?   (Similar comments apply to responses for this section as for Question 1.)

Table 5.3: Aspects of student work improved by computer use

Aspect	All (n=116)
Legibility	66%
Organisation of work	56%
Spelling	41%
Integration of text, tables and charts	41%
Grammatical structures	10%
Design graphics	2.5%
Increased problem-solving skills and statistical application	2.5%
Application to detail	1.7%
Increased output	1.7%
Detailed research	1.7%
Examination revision	0.86%
Enhanced self-esteem	0.86%
Enhanced conceptualisation	0.86%
Use of evidence	0.86%

The teachers' perceptions, therefore, were focused on presentation of the work which students generate, and the ways in which its elements are integrated. The predominance of word-processing in computer uses cited by staff respondents (71%) would correlate with this. If word-processing is the application most familiar to teachers, then these are the effects that will be most readily apparent when student work is assessed. The illocutionary message is that word-processed work, which is legible and well-organised will be rewarded more highly than hand-written work.

Teachers were asked whether they could quantify the improvement in terms of marks (Question 4).

Table 5.4: Percentage improvement

Improvement	0-15%	16-25%	26-50%	50%+
ALL	21% (23)	16% (19)	4% (5)	2.6 (3)

Table 5.5: Age of students affected

KS3	KS4	16+
53% (61)	65% (75)	35% (41)

43.6% of teachers, therefore, felt that the use of computers improved work by up to 15%, and the student cohort most affected was Key Stage 4 – those taking GCSE. Almost 23% felt that work was improved by up to 25%.

5.   *Do you feel that the use of computers has had a negative effect on students' work?*

Table 5.6: Negative effects

YES	NO	No response
15% (17)	78% (91)	7%

Some 7% of teachers (8) identified the problem of 'Computer as scapegoat', in that students were able to use the computer as a reason for failing to submit work to deadlines. The limitations imposed by inadequate word-processing skills were also seen as a problem, together with an apparent lack of sequencing of work by some students. The use of inappropriate charts in documents was also seen as one of the negative affects produced by computers on students' work, where the focus was often on presentation, rather than content. One teacher commented that computers did not "…help…handwriting skills. Poor handwriting is not improved."

The significance of these comments lies more in what they reveal about the level of teacher intervention in students' work: teachers see themselves as judges of a finished product that is a reflection of a student's skills and abilities.

What is required is dialogue between teacher and student during the process, rather than final comment on the finished product.

Among other negative factors identified were the transfer of work away from school for those who had a home PC, and the accompanying disadvantage of those without home facilities. Those who were reliant on school machines took a long time to complete a task: "…they spend a long time writing up assignments." There is still a tendency to view word-processing as a variant of typewriting, in that a student's work receives its final polish through the medium of the computer.

6.   What are the benefits of encyclopedias and reference works on CD-ROM?

Table 5.7: Benefits frequently cited

Positive Responses = 72% (84)
Improvement in information seeking
Up-to-date and relevant
Motivation
Ease of access
Ease of cross-referencing
Stimulating learning

7.   Are there any drawbacks to these?

Unselective use of material with no editing or integration 32% (37).
Also cited as drawbacks were theft of CD-ROMS and the 'play' factor: students would use CD-ROM encyclopedias and browse them for 'fun', rather than being 'serious' and using them 'for work'.


Teacher computer use

Teachers were asked to indicate uses to which they put computers at school, for personal and curricular outcomes. The curricular applications were then grouped in terms of the software used by teachers with students.

Table 5.8: Staff computer use as part of the curriculum

W/P	D/B	Charts	S/S	CAL	DTP	Internet	CD-ROM	CALL
62%	27%	22%	21%	13%	8.6%	7%	6%	3%
(72)	(31)	(26)	(24)	(15)	(10)	(8)	(7)	(4)

(Key: W/P = word processing; D/B = database; S/S = spreadsheets; DTP = desktop publishing; CAL = Computer Assisted Learning; CALL = Computer Assisted Language Learning.)

Figure 5.2: Teachers' use of computer applications
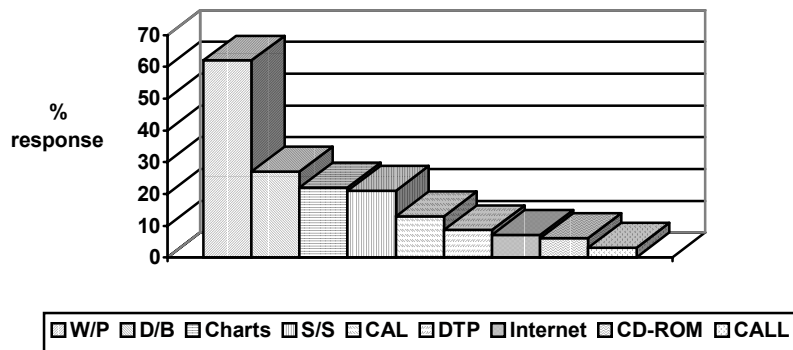
From this information, therefore, it can be seen that the majority of teachers focused on IT activities that produced short-term, measurable outcomes. These activities were also those undertaken at home, and ones with which the teachers themselves were most familiar.

Word processing was referred to as *'typing'* by most teacher respondents. This was the application used by most teachers on their home computers.

The focus on short-term, measurable outcomes carried across into the way in which teachers perceived the utility of what students did with computers.

When teachers were asked what impact they thought that computers had on students' work, their responses fell into three main categories. These can be grouped as transactional, cognitive or affective.

Not surprisingly, the most frequently cited set of responses fall into the category of transactional factors. This correlates with the most frequently cited curricular applications: word processing, databases, charts and spreadsheets.

Figure 5.3: Impact on students' work: teacher perceptions (% response)
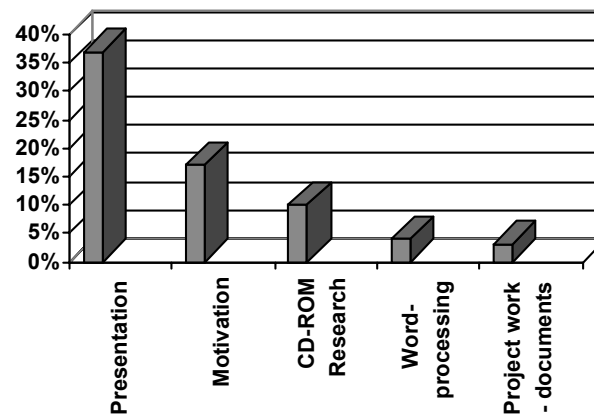
Presentation is the most visible factor when teachers assess student work. Many students recognise this. (See student comments in Appendix Two: Coursework and Marks.)

Figure 5.4: Aspects of work improved by computers: teacher perceptions
(% response)
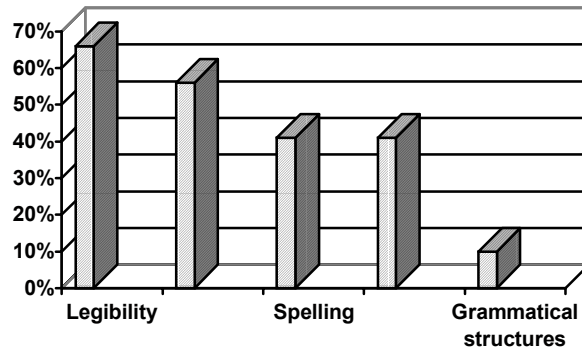
The four main aspects of work identified by teachers all relate to the surface of the work. When students are asked how they feel computers have improved their work a number of them refer to its more 'professional' look. (Further comments in Appendix Two.)

What teachers think: an analysis

Table 5.9: Transactional factors

The main impact of computers on student work	n=116
Presentation	37%
Motivation	17%
CD-ROM Research	10%
Word-processing	4%
Project work - documents	3%

Aspect of work improved by student computer use	n=116
Legibility	66%
Organisation of work	56%
Spelling	41%
Integration of text, tables and charts	41%
Design graphics	2.5%

These figures confirm teacher perceptions of the effects of computer use on students' work.

Almost half of the teachers surveyed (43.6%) felt that work was improved by up to 15%.

Nearly one quarter (22.6%) felt that work was improved by up to 25%.

It is factors such as legibility, organisation of work, spelling, integration of text and tables and overall presentation that differentiate student work within mark schemes.

These outcomes are based on recognisable IT skills. Even teachers who do not use computers are able to identify these factors as contributing to the overall quality of a piece of work. In terms of a Uses and Gratifications taxonomy, most of the teachers are grounded at the level of **Personal Identity: Value Reinforcement**.

Implications

Teachers who do not teach their students how to use information technology to produce their work are effectively disadvantaging them. Those students will not score as highly when the work is assessed.

Schools that fail to provide skills input and computer access for students who do not have a machine at home are compounding the disadvantage.

Table 5.10: Impacts

The main impact of computers on student work	n=116	Aspect of work improved by student computer use	n=116
Computer literacy	1.7%	Grammatical structures	10%
Integration of syllabus topics	1.7%	Increased problem-solving skills and statistical application	2.5%
Understanding of concepts	1.7%		
Computer as an extra tool	0.86%		
Drafting to improve content	0.86%		
Stats modelling	0.86%		
Variety of teaching styles	0.86%		

Teachers in the survey had a limited perception of cognitive factors being improved by computer use. Eight items received mention: integration of syllabus topics; understanding of concepts; computer as a tool; drafting to improve content; statistical modelling, variety of teaching styles; grammatical structures and increased problem-solving skills.

An improvement in the use of grammatical structures was the most frequently cited benefit (10%), and it could be argued that the provision of grammar checking tools in word-processors were responsible for that benefit. There was no suggestion that this gain transferred itself into other writing environments.

Teachers' perception of the cognitive benefits of computer use, then, tend to be limited, subject specific and measured in terms of the curriculum element for which the teacher has responsibility. There is no overview of ways in which students use computers for work across the curriculum. There is no evaluation of overall cognitive benefits for students.

Table 5.11: Affective factors

Aspect of work improved by student computer use	(n=116)
Attention to detail	1.7%
Increased output and volume of work	1.7%
Detailed research	1.7%
Examination revision	0.86%
Enhanced self-esteem	0.86%
Enhanced conceptualisation	0.86%
Use of evidence	0.86%

Table 5.12: Transactional factors

The main impact of computers on student work	(n=116)
Motivation	17%
Integration of syllabus topics	1.7%
Understanding of concepts	1.7%
Drafting to improve content	0.86%

The chief significance of the teacher responses presented here is that motivation is the greatest impact cited in terms of affective factors (17% of teachers felt that computers improved motivation). This would suggest that the active element in working with computers is a motivator for those students who perceive the experience of being taught as essentially passive.

The contribution of computer use to the enhancement of affective factors was implicit within many of the comments made by teachers. The increased motivation of many students when they were able to work on computers was seen as crucial to the improvement of the work. In the same way in which students were able to invoke the computer as scapegoat, this same process enables their teachers to take a more impersonal, functional view of work. Changing text and reprinting work is easy: this encourages re-drafting of work and increases output.

Staff perceptions: a summary

Positive perceptions:
- 80%+ agreed that students work was improved by computer use. Teachers stressed legibility, presentation and organisation of work as the main areas of improvement.
- 43% of all teachers stated that work was improved by up to 15%.
- More than 70% of respondents cited use of CD-ROMS as beneficial.

Negative perceptions:
- The use of computers and CD-ROMs highlighted inadequate information handling skills. Whilst students were able to access and retrieve far more information by using CD-ROMs, there was limited integration of this information into the students' work.
- Students would often convert data into inappropriate charts.
- There were equal opportunities issues for those without a home PC.
- Reliance by students on computers for the production of work failed to develop other skills, such as handwriting. (This comment echoed many similar comments revealed in media research by those worried about the displacement effects of new technology: that radio would displace reading; that television would displace radio listening (Himmelweit, Oppenheim and Vince, 1958); that computers would …).

Teacher perspectives:
- 62% of the sample stated that they used computers in the curriculum for word-processing, although no frequency of use was cited. One survey of more than 3,400 teachers (Keele University, 1996) cited 70% as using the computers 'very infrequently'. Another found that four out of five teachers claimed that they were not familiar enough with computers to make full use of them in schools (Technology Colleges Trust, 1998). Although 43% of UK schools might have had computers connected to the Internet, only one third of these provided their pupils with Internet access. (British Educational Suppliers Association, 1998.)
- The teachers' main use of a computer was for word-processing (71%). This activity was, however, often cited as 'typing'.
- When teachers own a PC the site of production for work-related documents moves from school to home - as happens with many students.

What computers don't do

The concerns that teachers in the survey expressed about the use of computers in schools were not, in fact, about computers per se. The concerns were about other aspects of the curriculum that computer use highlighted. Teachers felt that computers failed to do a number of things.

They did not prevent students from evading responsibility: students were able to invoke technical failure, networking problems and lack of access as plausible reasons to avoid deadlines. Many students failed to make sure that they had adequate word-processing skills before they produced a piece of work, which meant that those teachers who themselves lacked those skills were unable to help them. The work itself took longer to produce, students often failed to save their work appropriately and had problems retrieving it at a later date.

Many students failed to use appropriate charts when converting data. Their lack of understanding meant that, whilst the software could easily convert data into a graphical format, the students were unable to choose the most appropriate format. Often the criteria for selecting a chart type were the colours and shapes on the screen.

Many teachers felt that computer use prevented many students from improving their handwriting skills, whilst at the same time they often spending too much time 'writing up' assignments.

The use of CD-ROMS posed problems for some teachers: students would unselectively print out passages from reference disks as their response to an assignment, whilst other students would steal the CD-ROMS.

Computer Assisted Learning (CAL) and Computer Assisted Language Learning programs (CALL) suffered when students used games-playing techniques and strategies with educational computer programs. These students saw the object of the exercise as 'winning' and achieving a high score, rather than using the program to reinforce learning. It may well be argued that despite this perception on the part of students, learning did take place, albeit at an implicit level. The significance of the reaction, however, is that it would appear to produce behavioural effects at variance with those expected in classroom learning.

One problem that teachers identified was that many students with a PC of their own preferred to work at home, rather than at school. This confirms many of the observations made by students themselves during the surveys. The reasons given by such students related to the amount of control which they had over their work environment at home, rather than at school. Whilst many of the examples referred to perceived limitations of school hardware and software, the amount of time which students could devote to work at home was also a factor. (See student comments in Appendix 2).

Students without a home PC are doubly disadvantaged in these circumstances. First, they are dependent on school ICT resources if they need to produce IT-based work. They have far less time which they can devote to its production, and far less freedom to experiment with a range of possible approaches. Second, given that in many schools the number of available computers is less than the number of pupils in the class, teachers allocate computers to those without one at home. This requires a range of tasks to be set to accommodate those who have computers at home: those dependent on school computers miss this additional work.

What the use of computers by students does, however, is to throw these issues into relief. They are central to the ways in which students learn, and are taught. They provide a focus for the ways in which teachers assess work.

The most significant issue, however, is the way in which productive capital, cultural capital, symbolic capital and educational capital are converging. Computers have become the site of conflict on which the class battles of the information age will be fought. Changes in employment patterns during the past decade have resulted in a growth of service-sector jobs, many of which require ICT capability.   A flexible labour market requires transferable key skills such as communication, application of number, information technology, problem solving, working with others and improving one's own learning and performance. Dependence on limited institutional resources, education and training will do little for students whose only asset is labour.

Ways in which students work and learn with computers are examined in the next section. Detailed student responses can be found in: Appendix Two: Coursework and Marks, and Appendix Three: What it the Mind?   How does it work?

Reflections

The most significant aspect of the results was the acceptance, on the part of teachers, of the disparity between the processes and abilities of students and teachers in using computers, and the conceptual gap with Information and Communications Technologies. Many teachers assumed that, because students could do things with computers, they knew how to do them and why they did them. Further, there was an assumption on the part of many teachers that there was one way of doing something – the 'right' way. They were privileging their students as 'experts' and destabilising the ecology of the classroom.

This was matched by an unwillingness by teachers to take charge of the technology for themselves. In part this was because many secondary school teachers still felt that ICT was a separate subject and was not part of their curriculum responsibilities. In part it was also due to the sense of fatigue felt by many teachers who struggled to keep pace with the remorseless flow of curriculum change and documentation visited upon schools.

In addition, a significant number of teachers felt that the disadvantage of those without access to a PC at home could be ameliorated by creating a computer-free zone in their classroom. A sub-text to this was the low level of ownership among teachers themselves. The purchase of a new computer represented a considerable proportion of their disposable income. Those teachers who used computers both at school and home, for a range of tasks, were more likely to be enthusiastic about using ICT in innovative ways within the curriculum. This is supported by the recent findings of Preston, Cox and Cox (2000) for the Teacher Training Agency. The Computers for Teachers scheme, introduced in January 2000, was an attempt to meet this need. A significant number of teachers, however, failed to take up the scheme and viewed it with suspicion.

Using the information

As I looked at the results of the surveys, talked to students and felt the currents shifting in my own classes I was aware that I may be looking in the wrong

direction; trying to make sense of the wrong signs. I was looking at what the students were producing, expecting to see an increase in the number of transactional reports and the quantity of data being analysed. I realised that the greatest change was in the way these objects were being produced, and the changing student attitudes towards them. Students could do things with computers, but there was no guarantee that they knew how to do them in a systematic way, or could repeat their work. What was uncertain was whether or not students possessed a mental model of the processes in the systems they were using (Hagmann, Mayer and Nenniger, 1998). Knowing why they did them, as a series of routines that formed part of operational procedures, was difficult to establish. Part of this difficulty may well have been the difference between being able to do something, and analysing and describing the process. However, many students felt that they worked intuitively, and that their computer 'made it work'.

Students knew that there were a number of ways in which tasks could be undertaken: their computers could achieve the same outcome through a number of routines. Their teachers, however, often assumed that there was one way of doing something. The authority of the teacher was being further undermined.