Part 5 – Conclusions and Recommendations

Section 18 Concluding remarks

This research has made a substantial contribution to understanding:

- the relationship between ICT and standards of attainment (as measured through National Tests and GCSEs),
- how pupils are using ICT in school and at home and what might be gained from use in informal settings,
- teachers' views of the use of ICT in schools during the period immediately following the introduction of networked systems
- and case studies of the effect of ICT on teaching and learning in various settings.

The principal outcome of the survey undertaken for strand 1 is clear and by no means entirely expected: ICT has been shown to be positively associated with improvement in subject based learning in several areas. That contribution was statistically significant though not large. In none of the comparisons made between pupils' expected and actual scores in National Tests or GCSEs was there a statistically significant advantage to groups with lower ICT use. This is in some contrast to the findings of certain previous related enquiries, most notably the several evaluations of Integrated Learning Systems (ILS) published in the mid-to-late 1990s (NCET, 1994; NCET, 1995; Wood, 1998). Equally, there were not as clear a set of outcomes to the earlier ImpaCT enquiry conducted between 1989 and 1992 (Watson, 1998) carried out before the more recent developments of networked technologies and their growing availability in schools.

In strand 2, innovative methods were developed to collect evidence on the nature and extent of pupils' use of ICT, and pupils' understanding of the role of computers in today's world. In the home, many (but not all) pupils clearly had greater opportunities to use ICT for extended periods for a wide range of purposes. Access to networked technologies in the home has an impact on pupils' awareness and understanding of kinds of ICT equipment and the range of uses to which it is put. The views of teachers and pupils suggest that networked ICT has not yet been embedded within teaching and learning practices across the curriculum. However, the teaching of ICT skills has developed and specialist ICT courses leading to examinations are an important part of the KS4 curriculum. Hence, resources within schools at the time of this study were often heavily used.

Findings from strand 3 provided evidence that was both complementary and supplementary to that of the main study. The integration of networked technologies whilst being extremely important is still under development. Issues were identified relating to levels of resourcing and technical support in schools as well as professional development needs and staff access. In addition, differences in levels and quality of home access and use were also identified.

The observations made as part of this study took place during the early-mid period of the National Grid for Learning (NGfL) Programme – now the ICT in Schools Programme - during which the nature of ICT in schools, in terms of both provision and practice, have been developing.

It should be emphasised that evidence from strand 1 suggests that the proportion of subjects involving ICT (excluding specialist ICT courses and ICT skills development) in the ImpaCT2 sample was generally low over the period concerned. This is likely to rise as teachers gain in knowledge and experience, as equipment is made available in more classrooms and as there are improvements in variety of software available, both on the Internet and on CD-ROM.

Since 1998, when the Government published its proposals to develop a National Grid for Learning, schools and other institutions have made considerable progress in their use of ICT to support teaching and learning and to improve the efficiency of school management. However, while progress towards these goals has been significant and can rightly be celebrated, it is only the beginning of an ongoing transformation that over time will deliver exciting new opportunities in school, at home and in the community – for individuals to personalise their learning and realise their potential. These opportunities

will become a reality as ICT becomes firmly embedded in all aspects of school life rather than as an 'optional extra'.

While the schools involved in the ImpaCT2 study do not necessarily form a representative sample of schools in England, the statistical sections of the study have been objective and the sampling of schools and of pupils has been careful. This is to suggest that the results might have been different. Indeed they did differ at different Key Stages and subject areas. It should be noted that these discrepancies cannot easily be accounted for by a general so-called 'halo effect' – that is to say: 'good pupils in good schools work better all round, and – incidentally – spend more time on ICT'.

It was also clear, from visits to schools and from the various methods used to explore pupils' perceptions, that ICT was generally popular. That finding was perhaps to be expected. What was not anticipated was that for the most part pupils were familiar with handling computers and were not intimidated by the demands of the applications used. No doubt this is in part due to the increasing numbers of computers in homes, and in part to the effectiveness of the ICT curriculum itself in primary schools.

The following review of the findings overall is similarly based upon an analysis of the interactions between pupils, resources, teachers and, in the broadest sense, curriculum. It considers three perspectives:

- What is being learned?
- Issues for consideration in the school context.
- What is happening in the home?

What is being learned?

The findings indicate that a diversity of pupils are learning with ICT. Thus there is evidence that (for subject learning at least) learning benefits are being gained by some pupils at all the key stages investigated. Which pupils benefit is broadly speaking independent of gender and of ability as measured by initial achievement and socio-economic background. Furthermore, pupils are engaged in a wide range of innovative uses of ICT in informal settings contributing greatly to their understanding of the role of computers and their development of networked literacy skills. Evidence from the qualitative strands of the research strongly suggests that impact on the curriculum is greatest when pupils' use of ICT is fully integrated across the curriculum as a whole through both classroom and home-based activities. The relatively low levels of impact on attainment reported below are to be expected since schools were at an early stage in the implementation of the NGfL focusing mainly on using ICT to teach ICT skills.

- Positive effects on school achievement for higher usage levels of ICT (based on pupil estimates of ICT activity) were found both at the level of the individual pupil and at the level of the school, although these were not large.
- The relationship between levels of ICT usage and effectiveness was not consistent across all key stages and subject areas at the school level. This suggests that it is to the contexts within which learning is taking place that we must look for what is influencing the degree of success achieved by different pupils.
- However, usage levels at school were generally low overall. This is likely to rise over time as ICT resources become more readily accessible and ICT use becomes embedded across the curriculum. Usage within schools is highest in Key Stage 2 for English.
- ICT usage levels to support school-work at home were often greater than usage levels at school, particularly in at Key Stage 3 and Key Stage 4.
- In none of the 13 comparisons was greater use of ICT associated with poorer outcome, whether in terms of relative gains or in terms of examination results (this contrasts with the findings of the first ImpacT project, where some negative correlations were found between IT and learning).
- Pupils are engaging in innovative uses of technology often outside the school context and are acquiring a complex range of skills and literacies in networked ICT, including a range of on-line social and communication skills.

- Many pupils have developed a complex understanding of the role of computers in the world today including a wide range of equipment and locations in which such technologies are used. At all three key stages there was a significant and positive relationship between home access to networked technologies and complex levels of understanding of kinds of use.

It is important to note that which particular subjects showed this effect may be partly due to the degree of alignment between what is learned through ICT and what is assessed in the examination (specialist ICT courses were not included in this analysis). For example, in science at Key Stage 4, there was a statistically significant relative gain associated with high ICT usage, even though ICT use was rated as either 'never' or 'hardly ever' by over 70% of pupils in relation to use at school and by over 60% of pupils in relation to use at home. Many pupils who used ICT for science, both in and out of school, did so by accessing GCSE revision sites - an activity with a high degree of alignment between what was done on the computer and what was subsequently assessed. But in science, it looks as if it was the specific content rather than the skills that were enhanced.

Issues for consideration in the school context

- The acceptance that networked technologies in schools are inevitable and beneficial is almost universal amongst teachers. However, many of them are as yet unsure as to the impact of ICT on attainment, although they acknowledge other benefits such as increased motivation and improved behaviour. ICT is perceived to be particularly beneficial for pupils with special educational needs.
- Now that the skills levels of pupils have increased very significantly, it is time for schools to concentrate their attention on using ICT in the teaching of curriculum subjects as an aid to improved attainment. Skills teaching should take account of the expertise that many pupils have already acquired through using ICT at home to avoid wasting time on teaching low level skills where this is unnecessary.
- Strategies for effective use of ICT resources, particularly searching on the Internet and use of ICT to support homework are still in development. At the time of data collection teachers lacked guidance on the location and evaluation of Internet based resources.
- Sustainability is key both in terms of ICT resources and technical support. Recruiting ICT competent staff and retaining them is also problematic. Levels of resources in schools are not adequate to meet demand and in some cases this can lead to individual pupils having different experiences even when taken in groups by the same teacher. In addition, home computers are frequently more advanced that those available within schools.
- Staff need access to ICT in order to develop their own confidence and competence levels, and if efficiency is to be maximised.
- Whilst recent formal and informal training has been beneficial although variable in quality, there is still a perceived need for more support for integrating ICT into the curriculum.

What is happening in the home?

- For many pupils, the levels of ICT usage in the home exceed the levels of ICT usage in the school. In the home pupils can access ICT for extended periods of time and have the opportunity to engage in exploratory uses.
- Home access to ICT (more than 90% in 2001) and the Internet (nearly 70% in 2001) is increasing but lack of it still clearly disadvantages a minority of pupils. Alternatives, such as after school provision or Internet cafes, lack flexibility and can be expensive.

Recommendations

What then are the implications for practice and policy of the enquiry when taken as a whole, bearing in mind not just the overall statistical results but also, and more especially, the picture that the pupils and teachers paint of their activities in schools and at home?

As identified through the qualitative strands of this research, schools are progressing through a series of three stages - acquisition and establishment of infrastructure; teaching of skills; and embedding of ICT in subject teaching. The infrastructure is now in place and upgrading is on-going; the ICT skills of pupils and staff have developed substantially; but the integration of the use of networked technologies in curriculum subjects is only just beginning.

Plans for improvement can be usefully organised into two stages. The first involves accepting the present situation but identifying the immediate improvements that are possible. In the second stage the focus moves to longer term and more radical improvements. These longer term changes could take two forms, separately or in combination:

- Radical innovations set within the school system alone.
- Fundamental changes in the relative roles and contributions of home and school to young people's development.

Immediate recommendations

Immediate short term improvements would include:

- A fundamental shift towards embedding ICT use across the curriculum. Pupils are more likely to acquire ICT skills through meaningful and authentic tasks. More time should be spent developing such skills within the curriculum rather than in discrete ICT lessons. Furthermore, a greater emphasis should be placed on the importance of ICT use across all curriculum subjects to support teaching and learning. This will inevitably have implications for levels and flexibility of resourcing, technical support and staff development.
- Staff development centring upon the use of networked ICT in the classroom across the curriculum, including the effective use of whiteboards.
- Staff development relating to the uses and abuses of word processors, whether at home or in the classroom.
- Staff development relating to the most worthwhile ways of exploiting the potential of the Internet, relative to the capabilities of the user, including the development of effective search and evaluation strategies. This should include ways of helping pupils use these resources to develop higher order skills within the age range and subject context involved.
- Staff need access to light-weight, portable ICT resources in order to be able to develop their own ICT competencies and skills. They also need time to devote to preparation and professional development with regards to ICT. Funding should be provided to ensure that this is universal.
- Auditing and increasing the levels of a school's use of existing ICT equipment. Hardware and software need to be up to date, reliable and well-maintained. Technical support is needed in all schools, even if clusters of schools share personnel and expertise.
- Schools should be aware of the increasing capabilities of many pupils, particularly in the change from primary to secondary schools, and make allowances for this, particularly in relation to the development of ICT skills. It would be beneficial to review the curriculum with this regard on a regular basis. Self-auditing approaches, supported by self-teaching packages, might be the best way of dealing with the increasingly mixed-ability skills profile of pupils.
- Reviewing the role of ICT-based homework to enable pupils to work more effectively in the home context. Given that nearly 50% of pupils used revision sites in Year 10 and nearly 75% in Year 11, it would seem important to alert more teachers and pupils to the existence of good quality revision sites and to advise on their use. There could also be a more creative approach to homework and self-directed projects.
- Action within existing constraints to reduce the digital learning divide including home Internet access. Schools should carry out an audit of home ownership in order to target support on those pupils without access to ICT outside school. Other methods that are already being tried include after school and lunchtime access, home loans of computers (including thin client technologies) and public library provision of opportunities for Internet access and study facilities. Some of these approaches offer limited flexibility and can incur costs.

- Better communication between home and school regarding the ways in which ICT is being used by pupils in both locations, and whether or not the benefits reaped by home use can be utilised in schools and vice versa. Schools could play a significant role in disseminating models of good networked ICT practice because parents are not always sufficiently aware of what schools are doing or how this might affect the sorts of ICT-related activities that pupils carry out at home. Schools are not always aware of the extent or nature of their pupils' ICT experience in other settings, and how this might influence the types of activities they can engage at school. Parents need to be aware of the importance of home access of ICT and the potential learning that can occur through leisure use including games (a term often used by young people to describe non-school related use of ICT at home).

Longer term recommendations

All of the above proposals indicate immediate measures that can be taken to promote a more widespread and a more efficient use of ICT to deliver the conventional curriculum working within the existing expectations of pupils and others involved. In the somewhat longer term, and still within these limits, the changes should include:

- Increasing bandwidth. Bandwidth is becoming increasingly important and broadband will become part of the basic minimum requirements for effective use. Where schools had broadband connections, the advantages of speed and reliability were readily recognised despite the extra costs of installation and running. Where there was no broadband connection, either because of cost or availability, the schools were keen to introduce it, as it was seen as an essential prerequisite for running an acceptably fast service to their students.
- Widespread use of light-weight laptops and wireless networking with the aim of every pupil as well as every teacher having access to ICT throughout the day, both at home and at school.
- Use of email and conferencing to enable pupils to contact others for homework advice and other kinds of support.
- Electronic sharing of specialist teachers between schools.
- More diverse ways of spreading ICT expertise throughout the school community, particularly those involving flexible ICT resources, with wireless-linked or laptop portables for use by pupils when needed.
- Any future large-scale ICT training initiative will need to be more closely matched to the needs of individual teachers. To that end, school managers will need greater guidance on how to select an appropriate training package
- An evolving whole school policy on the resourcing, deployment and use of ICT.
- Supporting parents in using networked technologies to communicate with teachers.
- A thorough reappraisal of the content of the curriculum and assessment practices in the light of what can be achieved by fully exploiting the potential of ICT. The implications are likely to involve new thinking on the part of all concerned in education, including teachers and researchers, administrators and examiners, and not least, publishers and developers.

In the words of more than one teacher: "ICT is there; it's here to stay; it's [just] a tool". The implication is that it is useful, as tools are, but also that its potential is quite limited. That second implication is incorrect, even though ICT may not work miracles. However, it should be noted that this study was not designed to measure these other benefits.

There is evidence that, taken as a whole, ICT can exert a positive influence on learning, though the amount may vary from subject to subject as well as between Key Stages, no doubt in part reflecting factors such as the expertise of teaching staff, problems of accessing the best material for each subject at the required level, and the quality of ICT materials that are available.

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Appendices

Appendix 1: ImpaCT2 Research Methodology

As described in section 3, the ImpaCT2 study involved 60 schools. 30 primary schools and 25 secondary schools were selected using various criteria including:

1) a recent (post 1996) Ofsted report and the Ofsted rating of the ICT resources in an inspected school, based on a rating on a scale of 1 (High) to 7 (Low); those schools with a rating of 1 or 2 for ICT resources were included as a 'high ICT' sample and those schools with a rating of 4 for ICT resources were included as an 'average ICT sample';

2) participation in the PIPs or YELLIS projects, that aim to show 'value added', using a measure of initial achievement based on tests completed two years prior to the date set for the final criterion tests (National Tests or GCSEs in June 2001);

3) demographic indicators used to ensure that the sample would be representative of the population of schools in the country; schools were organised into three geographical zones: west and north west, east and north east, and south**.**

For more information on the sampling strategy adopted see Impact2 Project Preliminary Study 1 (McFarlane et al, 2001), appendix C.

In addition to the schools in this section, the study included five Special Schools. These were not required to participate in strand 1 of the enquiry, although data was collected using the same instruments where relevant and appropriate.

A 'Teacher researcher' was selected to co-ordinate the project in each of the 60 participating schools. They played a particularly important role in gathering data regarding how ICT was being used including administering questionnaires and other tasks to pupils including concept mapping, reporting on different aspects of ICT use on a monthly basis, interviewing other teachers in the school, and co-ordinating visits by research staff. In addition, two conferences were offered to provide orientation, guidance and initial feedback. The teacher researchers each received a laptop to help them with the tasks that they were expected to perform.

Samples of approximately 20 pupils were selected from each primary school, representing a range of ability at Key Stage 2. Two similar samples were formed for every secondary school, from among pupils in Key Stages 3 and 4 respectively. Within these samples, data were available on initial achievement, and every pupil completed a three-part questionnaire on their ICT experience on two occasions separated by a year (Summer 2000 and Summer 2001). The attainment criterion was derived from National Tests taken in June 2001 (Key Stages 2 and 3) and GCSE in the same month (Key Stage 4). Taken together, the three sets of data (initial achievement, ICT experience and final attainment) provided the information that would be necessary for the analysis on the impact of ICT.

The initial achievement data for the primary sample were obtained from PIPS tests administered in autumn 1999. At Key Stage 4, these were based on YELLIS scores at the same period. At Key Stage 3 parallel scores were not available for Key Stage 3 (the schools concerned were the same as those involved for Key Stage 4) and accordingly the scores for National Tests at Key Stage 2 were adopted as the measure of initial achievement.

ICT experience

As has been noted, all pupils in the sample completed a questionnaire in July 2000 and again in July 2001. These questionnaires related to their ICT experience over the immediately preceding 12 months and the results of the second were used to calculate estimated ICT experience during the critical period, this being the year leading up to the assessment.

The questionnaire included a section on the extent to which the computer had been used for learning within a specified subject area in each of three settings: during lesson time; outside lesson time but within school; and outside school including home use.

The question was repeated for each relevant subject to take account of variation in computer usage in different subject areas. Answers to these questions were given on a 5-point scale from "Never" to "Most weeks", thereby allowing conversion to a 5-point score for each context. These were then averaged for each subject area.

To find out the effect of ICT in any given subject within the population as a whole, pupils were allocated to one of two groups, 'High ICT' versus 'Low ICT', according to whether their score fell above or below a cut-off point based on the median score for that subject at that Key Stage. The two groups were compared using a two-way ANOVA to test for differences in attainment based on individual pupil scores.

Another set of questions dealt with type of computer usage with options including word processing, access to the Internet and use of e-mail, and allowed for completion of more than one cell as appropriate. However, the data for Internet usage should be interpreted with caution, as they represent yes/no responses for Internet usage and do not discriminate for frequency.

Mean ICT levels for schools

To begin with, it was envisaged that between-school comparisons would be based on the original selection process, that is the Ofsted categorisations to group schools by 'high ICT' usage and 'average ICT' usage. However, the pace of change in ICT provision and use had been rapid over the intervening period and it was found that such a categorisation corresponded poorly with ongoing observation. An attempt at categorisation by project researchers proved little more fruitful. It was therefore decided to use mean subject related ICT scores (on the above 5-point scale) as the measure of ICT level for each subject separately within each school. For certain statistical calculations, the schools were then grouped (again separately for each subject and key-stage) as High, Intermediate or Low in ICT provision. The three groups were compared using a two-way ANOVA to test for differences in attainment based on individual pupil scores.

Thus none of the following comparisons rests on some more or less arbitrary dichotomy of schools on the basis of overall ICT.

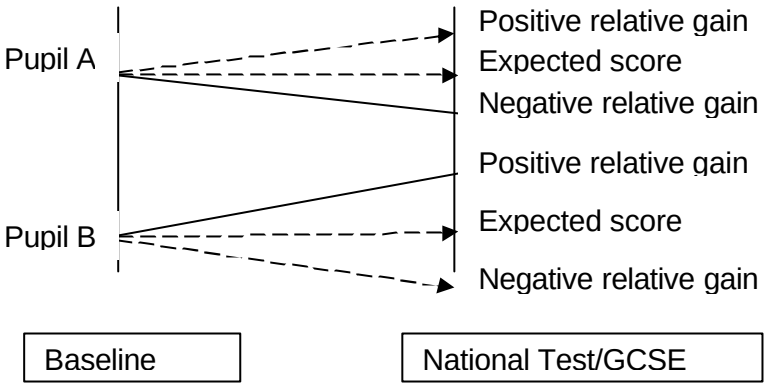
Initial achievement and relative gain

Because the schools in the sample vary in their catchment areas and hence in the opportunities afforded by the home and neighbourhood, and because similar considerations apply to pupils within schools, it would have been inappropriate to accept raw National Tests and GCSE scores as criteria of final performance. There is large body of evidence indicating that relative gain can be calculated to measure the progress of individuals and groups over a period by adjusting final raw scores to take into account the score that might be 'expected' on the basis of initial achievement on one or more relevant tests. Such calculation goes a long way to producing a level playing-field for comparison. Thus the following sub-section is based on comparisons of relative gain scores between groups of schools and of pupils based on their ICT provision and experience.

Comparison of these baseline scores with the final grades of pupils in National Tests or GCSEs taken in the summer of 2001 allowed the calculation of an **expected** score for every pupil. The difference of his or her actual result from that 'expected' is taken as a measure of '**relative gain**'.

A relative gain score of zero indicates that a pupil's National Test score was as predicted by the baseline test, a positive relative gain score indicated that the pupil had exceeded expectations, a negative one that the pupil had not achieved the result expected. The size of a pupil's relative gain gives an indication of how that pupil performed compared to other pupils starting from the same baseline position. For example, a pupil who achieved a result one standard deviation higher than the mean for the population of pupils starting from the same position would achieve a relative gain score of + one. (Standard deviation is a statistical term for the average difference from the mean for a group of results).

In the illustration below, Pupil A has a higher test score than Pupil B, but performed worse than expected, and so has a negative relative gain score. Pupil B, by contrast, performed better than expected and so has a positive relative gain score.



This method of comparing pupils' outcomes and relating them to their use of ICT overcomes the problems posed by other differences between schools in the two samples (such as variations in their catchment area and hence in the opportunities afforded by the home and neighbourhood), if 'raw' National Tests and GCSE scores are used as criteria of final performance. There is large body of research evidence indicating that relative gain can be calculated to measure the progress of individuals and groups over a period by adjusting final raw scores to take into account the score that might be 'expected' on the basis of initial achievement on one or more relevant tests. Such calculation goes a long way to producing a 'level playing-field' for comparison. Hence the following section is based on comparisons of relative gain scores between groups of schools and of pupils based on their ICT provision and experience.

Mean relative gain scores

Pupils were grouped into categories of high and low ICT users based on their level of use of ICT in a particular subject. The mean of the relative gain scores was calculated in each National Test and GCSE. These could then be compared.

The use of standard deviations as the measure of relative gain provides a standardised method of making comparisons between subjects, which allows for differences of spread of attainment in these subjects.

The mean relative gain scores across the three Key Stages included in this study have been standardised, for the purposes of easier analysis by the reader of the varying impact of ICT use across the Key Stages. The figures reporting mean relative gain by Key Stage and subject have a mean of zero and a standard deviation of one.

What is statistical significance?

In order to begin to understand whether there is some kind of association between the use of ICT and performance in National Tests or GCSEs, it is necessary to apply test of 'statistical significance. 'Statistical significance is a measure of how confident it is possible to be that an observed difference between two or more groups can be attributed to something other than chance. The most commonly encountered way of reporting statistical significance is called the 'p value'. This is the probability that the difference(s) observed between two or more groups in a study would have occurred if there were no differences between the groups other than those created by chance.

The differences discussed in this report were statistically significant at the .05 level or lower. This means that a difference equal to or larger than the observed difference is likely to occur less than five times in 100 by chance alone.

Concept mapping

An innovative form of concept mapping was used and is fully described in the main body of the document. Its aim was to identify the level and range of pupils' understanding of the role of computers in today's world and how that developed over the period of the evaluations. Both quantitative and qualitative methods of analysis were used, the former being particularly important to investigate correlations between complex maps and levels of use of networked ICT, the latter providing insights to the quality and nature of individual pupils' conceptualisation of ICT.

Analysing the concept maps

Altogether 1,738 baseline concept maps were submitted in June 2000 (653 Key Stage 2, 534 Key Stage 3 and 551 Key Stage 4) and 1,482 in June 2001 (619 Key Stage 2, 486 Key Stage 3 and 377 Key Stage 4). Following analysis, the study team selected 12 concept maps, four from each key stage, that either seemed representative, gave contrasting data, or showed interesting or unusual features. They interviewed these pupils and analysed each of their maps in depth. This selected rather than representative sample enabled the study team to check the validity of the concept mapping by comparing verbal and paper-based accounts. Every pupil interviewed was able to explain why they had included particular features in their map and why they had linked images or words in particular ways.

The method for coding the maps was developed using the phenomenographic theories developed by Marton (1994) and his group of researchers. The starting point is the way in which human beings focus their awareness differentially on whatever comes to their attention. Some features of the phenomenon (an object or set of ideas) become the focus of attention and others remain as the background field. There is variation between different people in how they first become aware and then develop their conceptual understanding of a phenomenon. Marton and his colleagues developed the theory that these variations fall into distinctive patterns. There will always be a small number – usually five or six – distinctive ways in which humans experience (and learn) any concept or set of ideas. Analysis of the ImpacT2 concept maps focused, therefore, upon looking for patterns across the sample as a whole in pupils' awareness of computers in their world. What knowledge did they have, whether fully comprehended or more peripheral in their thinking? And what were the patterns in the ways that the sample as a whole built up that knowledge?

Quantitative analysis of the concept maps

Quantitative analysis of the concept maps enabled the study team to gain an overview their content as a whole. Rather than approaching the maps with preconceptions of what should be there, intensive study of a sample of around 40 maps was initially undertaken by two researchers who worked independently and later compared results. Emerging categories were then refined in discussion with three other researchers. Initial disparities were around, for example, what counted as nodes and confusion over labels. As a result of discussions, more detailed procedures were developed and additional items were added to each of the categories in order to make the analysis more sensitive to individual variation. Where it was necessary to make fine judgements these were standardised across all raters, so that for example a picture of the world globe was counted as 'information gathering' and the '@' sign was counted as 'communication'. This ensured that the coding of the maps was consistent, despite some lack of clarity as to the precise intended meanings of individual pupils.

1) Firstly, the number of images (nodes) in the maps was counted. No account was taken, at this stage, of what these images might be and no judgements were made as to their appropriateness or 'correctness'. It was clear from preliminary qualitative analysis, however, that maps with a large number of images generally indicated understanding of a wider range of computer equipment and electronically related human interactions and activities than maps with a small number of images.
2) Secondly, the number of links between the objects in the maps was counted. Again, the study team did not make judgements about the appropriateness or 'correctness' of the links. Once again, it was clear from preliminary qualitative analysis that maps with a large number of links generally indicated understanding of the technical linkage between computer systems and the ways in which they enable connectivity between people. The counting of links became difficult when there was a large number, so they were counted in two stages: firstly the number of links from each node was counted and written beside it; secondly these numbers were totalled to give the number for all

nodes across the map. Each link was, therefore, counted twice because it linked two nodes. Occasionally complicated by 'branching' links, the study team decided to count the branches to different nodes as separate links.

3) A third category of analysis developed by the evaluators was a 'connectivity' score consisting of a simple ratio of the number of nodes to the number of links. This was derived by computerised calculation. There was considerable variation across the sample, with simpler maps based on a central object linked to a number of surrounding objects having a 'connectivity' score of around 2:1 and some maps with large numbers of links achieving connectivity scores of 5:1 or higher. (There was, however, some effect whereby maps with a very large number of nodes were less likely to achieve high connectivity scores, probably because those pupils ran out of time.)

4) The fourth category was labelled 'spheres of thinking', and as originally defined, consisted of awareness – as indicated by the drawn images – of one or more of the following: for example, information gathering, communication, computer games, music/sound, images/photos and advanced control mechanisms. Each sphere of thinking identified in the map counted as one even if represented by two images, so that, for example, two drawings of a digital camera and a scanner counted as one 'images' sphere of thinking.

5) The fifth category related to the locations or virtual locations for computer-related activities depicted in the maps. This overarching category was labelled 'zones of use', and as originally defined consisted of awareness – as indicated by the drawn images – that computer-related activities take place in one or more of the following places: for example, home, school, workplace, transport and hospitals (ambulances); or provide a virtual location for activities such as shopping.

A score sheet was devised, a spreadsheet was prepared and each concept map was photocopied. The full sample of maps was then coded on the basis of judgements by an individual 'rater'. On the score sheet, the researchers recorded the number of nodes and links, and ticked the occurrences of spheres of thinking and zones of use that could be identified in the concept map, the number for each then being tallied. The same methods of analysis were used for the second sample of concept maps produced in June 2001.

Qualitative analysis of the concept maps

A fuller phenomenographic analysis was also possible as patterns of pupils' ways of experiencing computers in their world began to emerge. In follow-up one-to-one interviews with a sub-sample of 34 pupils (approximately nine months after concept map production) it was possible to begin to explore the dominant groupings of items. This indicated that despite the uniqueness of the perceptions of each individuals, the group as a whole provided examples of four or five typical patterns of awareness.

Pupils also undertook a writing task approximately a week after the baseline concept mapping. Those in Key Stages 2 and 3 gave an explanation of how computers are used in our world to a visitor from another planet and the Key Stage 4 pupils explained the most important uses of computer systems in present-day society, their advantages and disadvantages and what changes to everyday life they imagined in the future. The aim of the writing was to ensure that those whose preferred mode of communication was continuous writing should not be disadvantaged. However, the analysis showed no evidence that pupils could not express themselves in concept mapping at least as well as in writing, and in many cases they conveyed much more information; hence, the written task was not repeated a year later.

Data collection instruments

A variety of instruments was used to establish the degree to which ICT has penetrated the learning and teaching of the schools in our sample.

Firstly, the Pupil Questionnaire, was specifically designed to yield quantitative data bearing on the extent of computer usage by every pupil in the sample and the manner of such use together with relevant circumstances. These last relate especially to the location of use, chief among these being

Home and School. The Pupil Questionnaire was administered at both pre-test and post-test to all pupils in the research project within all three key stages.

Secondly, Strand 2 of the ImpaCT2 research design focused on educational learning at home and more informal learning beyond school. The former might be in the form of homework, such as use of networked technologies to research a homework topic. The latter recognised that the wider learning context also includes use of networked technologies for personal interests, communicating in chat rooms or playing on-line games, which involve learning but may or may not be reflected in improved attainment. Whilst the computer could be used to do the same thing more efficiently, the study team also sought evidence of how ICT might change what and how pupils learn, looking at learning in its broadest sense and going beyond the school curriculum. In these out-of-school contexts pupils themselves were clearly the best-placed informants.

Drawing on the pupil hypotheses identified in Preliminary Study 2 (Lewin *et al*., 2000), key research questions were formulated and then, through a process of experimentation, consultation and piloting, transformed into four pupil activities:

- The pupil log
- The special report
- The Internet questionnaire
- The pupil-pupil interview.

These instruments used quantitative and qualitative measures to find out about the processes, nature and content of learning through asking for facts, descriptions, analysis, opinions and values.

The pupil questionnaire

The questionnaire is in three sections:

- Section 1 is concerned mainly with the availability of the relevant hardware outside of school, and more especially in the pupil's home
- Section 2 is concerned with the ways in which the pupil uses the computer outside lesson time – again including home usage.
- Section 3 is concerned with the extent and manner in which the computer is used for learning in specific subject areas. Separate questions in this section bear on use in lesson time, use in school outside lesson time, and computer use outside school. The same questions are repeated to allow the pupil to provide separate estimates of usage for each core subject (English, mathematics and science) at for pupils at Key Stage 4, in other subject areas.

Following careful piloting in a number of schools, it was found that the same instrument could be used with both Key Stage 2 and Key Stage 3 pupils. The precise format of the questionnaire at Key Stage 4 was modified slightly to match corresponding differences in curriculum provision. Care was taken to ensure that the Teacher Research Co-ordinator provided the instructions and explanations necessary for all the pupils to categorise their experience in the same way.

It was hoped that the full questionnaire would be completed by every pupil in the sample on each of two occasions, during the summer term of the year 2000, and during the same term in 2001. Inevitably there were absences and some schools failed to return the second set of questionnaires. These had to be excluded from the reporting of results. Despite this attrition, the data that were analysed are sufficient to provide two fairly detailed datasets. These illustrate the extent to which recent technological developments have penetrated the schools and homes of pupils in the sample and influenced the activities of pupils and teachers, as described below and also in Section 2 above.

The pupil log

The pupil log was designed to monitor use of technologies including on-line resources both at school and at home over the period of one week, including a weekend. Table A2.1 indicates the responses received.

Table A2.1 Distribution of Pupil Logs received from all schools

	Primary		Secondary		Special		Total Reponses
	Schools	Logs	Schools	Logs	Schools	Logs	
KS2	20	276			1	4	280
KS3			11	64			64
KS4			14	51			51

Although not all primary schools responded, because they were given to whole classes in many cases, rather than ten pupils only, the total number of responses received met expectations. In the case of secondary schools, only 16 of 28 schools responded and often only with one or two logs from each key stage. Therefore the number of responses received from secondary schools was much lower than expected. The analysis of this data was primarily quantitative. However, atypical individual cases are described in the form of vignettes to illustrate the diversity of reports that were received.

The structure of the logs differed for primary and secondary phases. The Key Stage 2 version asked pupils to describe their use of ICT at school and at home on a day-by-day basis, indicating which resources they used and how much time they spent. They were then asked how much time they had spent on three aspects of computer use during that week: 1) for educational learning, both non-networked (for example, word processing, art packages, spelling games) and networked (for example, e-mail, web sites); 2) for leisure purposes (for example, games consoles, television, mobile phones); and 3) general information about their use of computers at home (for example, ranking their top five most used technologies for schoolwork and leisure). The secondary version was similar but with additional detail for some aspects (for example, computer use at school in subject lessons, computer use for homework by subject, use of electronic devices such as diaries, digital cameras, interactive whiteboards and so on).

As the primary and secondary pupil logs differed in their level of detail, analysis of each phase was undertaken separately. Due to discrepancies within the data, measurement of timing was analysed quantitatively and other entries were used for cross-checking. As pupils recorded time periods differently (for example, 7.15 to 8.00, one and a half hours), all responses were converted to minutes. Where responses were given as ticks rather than specific amounts of time, these were represented by the modal response (the most common number of minutes specified for that item in the pupil log). Other data (for example, the ranking of favourite resources) were coded. Descriptive statistics were collated for all responses. Inferential statistics were conducted on the total amounts of time reported using ICT at home and at school. In addition, differences in responses by gender were analysed for both phases, for all variables. The analysis of this data was primarily quantitative. However, atypical individual cases were described in the form of vignettes to illustrate the diversity of reports that were received.

The special report

The special reports were structured but they gave free choice so that the picture is likely to be more positive than the average. Pupils were asked to choose a time when using the computer had been helpful to them in their schoolwork. The format of the special report gave an insight into how each pupil at least tacitly envisaged, carried out and judged the results of a learning activity. Given that developing a capacity for self-directed learning is important for pupils, this gave an opportunity for pupils to reflect in their own learning processes and outcomes. The structure of the special report entailed the following:

- Planning the task (how they acquired the prior knowledge needed for the task, who decided whether they use a computer and, if they themselves decided, why).
- Carrying out the task (where the task was undertaken, choices around how long to spend, where to work, with whom they worked, whether they needed any help and the nature of that help).
- Outcomes of the task (what they discovered, any new understanding, and (for secondary only) specific kinds of learning).
- Pupil evaluation of the task (self-evaluation, the relative merits of computer based and conventional resources, what they were or were not pleased with, what changes, if any, they would make if they did the activity again).

166 pupils completed a special report with 123 returns from ten primary schools (including one special school) and 43 returns from 12 different secondary schools (22 from Key Stage 3 and 21 from Key Stage 4 pupils). The analysis of this data was qualitative.

The Internet questionnaire

The Internet questionnaire focused on how and why pupils use the Internet both in and out of school for their own interests and schoolwork. Teacher-researchers were asked to ensure that pupils undertaking this task had experience of using the Internet. The study team anticipated that this would include both use for schoolwork and personal interests.

In the Internet questionnaire, pupils (both primary and secondary) were asked about:

- Their favourite web sites and frequency of use
- The kinds of things that they do when visiting web sites (for example, downloading files, following hyperlinks)
- How they find out about web sites (for example, family, friends, teachers, television, magazines, food packaging)
- How often they use search engines
- Whether they use the Internet most in school or out of school
- How they decide which web sites are good
- Whether they use text-based search engines
- Specific examples of Internet use for leisure
- Specific examples of Internet use to support school work (in specific subject areas for secondary pupils)
- Specific examples of e-mail use.

The study team received a total of 227 Internet questionnaires: 35 from Key Stage 2 pupils, 59 questionnaires from Key Stage 3 pupils, 77 questionnaires from Key Stage 4 pupils, and 56 questionnaires from special school pupils (mainly from a single school). Although not a numerically large sample it was drawn from 29 of the 60 participating schools and the findings are not necessarily unrepresentative of the wider population. The questionnaires were subjected to quantitative and qualitative analysis.

The pupil-pupil interview

Pupils volunteering to participate in this aspect of the research were asked to select and recruit their interviewees, to develop an interview schedule, and to write a report. All pupil interviewers were required to attend a briefing session and they also received written guidance (separate primary and secondary versions) that raised issues about interviewing, gave tips on planning and setting up the

interview, and set out detailed instructions about how to write and submit the report and cassette recording. In placing such demands on pupils to design their own interview schedules, carry out tape-recorded interviews, report on and interpret the resulting data, it was believed that data would be generated on:

- How pupils are using networked technologies outside school for their own interests
- The ways in which they communicate and handle information for leisure and entertainment as well as for schoolwork.
- Their perceptions, concerns and values with regard to networked technologies.

The interview reports were diverse. Since what pupil interviewers chose to ask was as interesting as how interviewees replied, the team decided to analyse both questions and responses. It was hoped that this would provide indicators of young people's interests, priorities and views, although in follow-up interviews conducted by the link researchers, it was sometimes difficult to determine whether pupils had asked the questions they thought they should ask on behalf of the adult study team or whether their interviewing reflected their own concerns. Similarly, this raised questions about the extent to which interviewees might have given the kinds of responses they thought appropriate to a national research project.

Qualitative analysis was undertaken on three levels. Firstly, a broad-brush analysis was structured around the topics defined in the guidelines (electronic games, the Internet and mobile phones, and rules about using ICT at home). Secondly, a more fine-grained examination of a set of interviews produced by one primary and one secondary school provided an insight into the style and content of the interviews and reports. Lastly, a detailed analysis of one interview was undertaken. This was chosen because of the apparent enjoyment of the participants, the meticulous transcription undertaken by the eleven-year-old pupil and its key themes.

In total 52 reports and tapes were received from ten schools (seven secondary and three primary). It would be fair to say that fewer schools chose this instrument because of the demands made upon both teachers and pupils.

The case study reports

Six schools were chosen as case study schools. These exemplified at least one key innovative practice with regard to their use of ICT. The case studies drew on data arising from school visits but also related to key themes identified in the Invitation to Tender. Each case study report followed a common structure:

- Introduction (reasons for selecting the case)
- Context
- Resources
- Teaching and learning
- Home use of ICT
- Teacher perspectives on ICT and attainment
- Internet safety/security
- Staff development
- Professional use of ICT.

Each case study report drew on different 'slices of data' including:

- Teacher-researcher monthly reports

- School visits where link researchers observed a range of lessons, collected curriculum materials, carried out group interviews with pupils, and interviewed both individual and groups of staff, head teachers, ICT co-ordinators and specialist teachers using ICT innovatively
- Pupil instruments
- Concept mapping
- Pupil questionnaires 1 and 2 (Strand 1).

Appendix 2: Supplementary analysis in strand 1

Differences in mean pupil relative gain scores when grouped by school ICT usage level

The tables that follow present the principal results yielded by standard ANOVA procedure alongside those of multi-level ANOVA carried out on the same data at the University of Durham. This was conducted at an earlier stage of the analysis and is presented in different ways from other data in the main body of this report. The groups have been organised differently (into three rather than two, by school means rather than by individual pupil scores) and this has had an effect on significance levels and mean relative gain scores, especially where the distribution is uneven. For each subject, at each key stage (13 in total), the schools were ranked according to the mean use of ICT reported by pupils in that subject area and then divided into three groups. The analysis was based on the relative gain scores of individual pupils. Equally, in the multilevel modelling conducted at the University of Durham the pupils have been grouped differently. Whilst it is not surprising that different approaches to data analysis lead to slight differences in results, it has been informative and broadly speaking has confirmed the robustness and validity of this data.

The ANOVA tables below are based on two-way analyses of variance, measuring gender effects as well as ICT effect, together with their interaction. The gender effect, which was often highly significant (especially in English), is not included in these extracts as the findings replicate trends that are well-known. There was no indication of interaction between gender and the ICT effect. Group sizes are given only for non-core subjects at Key Stage 4. In the remaining comparisons the samples are of the order of 400 – 500 pupils, with more than 100 in each of the three ICT groups. The complete analysis of variance tables may be obtained from the project director together with parallel analyses that were carried out using the original uncorrected SATs and GCSE results.

Table A2.1: Analysis of Variance: Principal Results for School Groups at Key Stage 2

	Standard ANOVA				**Multi-Level ANOVA**		
	MEAN RELATIVE GAIN				EFFECT SIZE (STANDARD ERROR)		
Group	English	Maths	Science		English	Maths	Science
High ICT	**1.82**	**1.63**	**1.47**		**0.54 (0.26)**	0.29 (0.31)	0.18 (0.32)
Medium ICT	**1.39**	**- 0.02**	**- 1.31**		**0.45 (0.25)**	0.12 (0.29)	0.01 (0.31)
Low ICT	**-1.81**	**- 3.15**	- 0.29		0	0	0
sd	8.64	14.88	8.54				
Significance	P < .001	P <.05	P <.05		P < .05	NS	NS

In Table A2.1 ICT is associated with a linear trend (higher gains when ICT use is greater and lower gains when ICT use is lower) in English and in mathematics in the standard ANOVA analysis. In Science however the medium ICT usage group drops below the low ICT usage group. The multilevel analysis confirms the positive impact of ICT use in English as the results are statistically significant but this is not the case for Maths although the results suggest that a linear pattern also exists. This is also in line with the finding reported in section 5 of a statistically significant and positive effect of high ICT in Key Stage 2 English.

Table A2.2: Analysis of Variance: Principal Results for School Groups at Key Stage 3

	Standard ANOVA				**Multi-Level ANOVA**		
	MEAN				EFFECT SIZE (STANDARD ERROR)		
Group	English	Maths	Science		English	Maths	Science
High ICT	- 0.10	0.20	0.22		- 0.36 (0.28)	0.29 (0.23)	0.10 (0.16)
Medium ICT	0.10	**0.32**	0.03		- 0.12 (0.28)	**0.46 (0.24)**	- 0.03 (0.16)
Low ICT	0.09	**- 0.20**	- 0.20		0	0	0
sd	0.96	1.01	1.04				
Significance	NS	P < .01	NS		NS	P = .06 (M ICT)	NS

In Table A2.2 there is a linear trend in science, while the medium ICT usage group achieves significantly higher gains in mathematics. This is a finding that is confirmed by the multilevel ANOVA analysis conducted by the CEM centre. Differences are minimal in English, but the High ICT group here is associated with the least gains. The relationship appears to be linear for Science but this is not statistically significant. In the main report, the analysis by pupil individual gain scores reveals a significant positive impact of ICT for Science. Whilst this is not replicated in the additional analyses there does seem to be a positive association for science. In addition, the way in which the data has been organised (grouped by school mean ICT usage score rather than pupil individual ICT usage score) will lead to greater variance between individuals in each group, which will affect the likelihood of finding a statistically significant result. That is, individual use within a school will vary as pupils will have differing experiences in the classroom as a result of different levels of use by each teacher and differing experiences outside the classroom as a result of different levels of access and self-motivation to use ICT to support learning. This is particularly the case in secondary schools where pupils are likely to have different teachers for each subject.

Table A2.3: Analysis of Variance: Principal Results for School Groups at Key Stage 4 (Core Subjects)

	Standard ANOVA				**Multi-Level ANOVA**		
	MEAN				EFFECT SIZE (STANDARD ERROR)		
Group	English	Maths	Science		English	Maths	Science
High ICT	0.26	0.31	**0.45**		0.15 (0.16)	0.13 (0.20)	**0.53 (0.23)**
Medium ICT	0.27	0.14	0.20		0.12 (0.18)	- 0.12 (0.20)	0.29 (0.26)
Low ICT	0.16	0.26	0.02		0	0	0
Sd	0.87	0.89	1.09				
Significance	NS	NS	P<.001		NS	NS	P = 0.02

In table A2.3 the trend is significant and linear in science. In the remaining subjects it is not significant - and in mathematics it is non-linear. This confirms the findings reported in the main body of this text, that there is a statistically significant positive impact of ICT usage on science at Key Stage 4.

Table A2.4: Analysis of Variance: Principal Results for School Groups at Key Stage 4 (Non-Core Subjects)

	Standard ANOVA				**Multi-Level ANOVA**			
	MEANS				EFFECT SIZE (SE)			
Group	Geog.	History	MFL	D and T	Geography	History	MFL	Design Tech.
Group size	60-70	30-100	120-170	100-170				
High ICT	0.34	0.19	**0.31**	**0.47**	0.07 (0.18)	0.13 (0.11)	**0.50 (0.19)**	0.23 (0.27)
Medium ICT	0.24	- 0.13	**0.14**	**0.08**	- 0.06 (0.17)	- 0.40 (0.37)	**0.34 (0.19)**	- 0.19 (0.26)
Low ICT	0.19	0.27	**- 0.25**	0.19	0	0	0	0
sd	0.85	0.79	0.92	0.96				
Significance	NS	NS	P < .01	P < .01	NS	NS	P < .01	NS

In Geography and in MFL (Table A2.4), the ICT effect is linear but not significant. In History it is neither. In Design Technology the effect is linear and significant in the standard ANOVA, while the Multi-Level ANOVA produces an anomalous outcome. This again supports the findings reported in the main text, where a significant positive impact of ICT usage was found for design and technology, and modern foreign languages.

Correlations of relative gain scores with ICT usage levels for school mean scores and for pupil individual scores

In order to gain further clarification regarding the influence of ICT implementation in the school on attainments in National Tests and GCSEs, it was decided to compare the correlations of two estimates of ICT usage with relative gain scores, using identical measures for pupils (individual relative gain scores) and for schools (school mean relative gain score). Two such measures appear in the following table: subject related ICT, and all ICT representing the mean ICT score across subject areas. Pupil correlations in Table 2.5 correspond to these scores as obtained by each pupil (i.e. about 600 at each Key Stage, but fewer for optional subjects at GCSE), while school correlations are calculated from school means for each of the above scores. The number of cases contributing to school correlations is therefore very much smaller, ranging from 17 schools at Key Stage 3 to 22 at Key Stage 4. It should be noted that statistically significant results can be obtained with weaker correlations when the sample size is large. Those correlation co-efficients that have one star were statistically significant at the 5% level ($p < 0.05$). Those correlation co-efficients that have two stars were statistically significant at the 1% level ($p < 0.01$).

Table 2.5 Correlations between ICT and Relative Gain for Schools and for Pupils

		Key Stage 2					Key Stage 3		
			English	Maths	Science		English	Maths	Science
School Means		Sub ICT	0.370	0.370	0.194		-0.222	0.457	0.345
		All ICT	0.499*	0.521*	0.304		-0.281	0.267	0.528*
Pupil Scores		Sub ICT	.140**	0.083	-0.019		-0.019	-0.003	0.101
		All ICT	0.114*	0.096*	0.066		-0.042	-0.002	0.017

	Key Stage 4								
			English	Maths	Science	History	Geog	Mod.Lang.	Design Tech
School Means		Sub ICT	0.266	0.035	0.271	-0.065	0.053	.584**	0.261
		All ICT	0.509*	0.377	0.381	0.453	0.469*	0.388	.602**
Pupil Scores		Sub ICT	0.076	0.026	.157**	0.008	0.003	.214**	0.108
		All ICT	0.047	0.024	0.055	-0.010	0.028	0.061	0.106

It should be stressed that the correlations for schools in the above table are not dependent on any prior categorisation of schools. The following points may be noted:

(1) At the pupil level, subject-based correlations are highest where they were significant in the analysis of variance and most, but not all of these, are significant

(2) Correlations at the school level are not statistically significant where the correlation co-efficient measuring the strength of the relationship is below 0.4

(3) Correlations at the school level are considerably stronger than correlations at the pupil level

(4) At the pupil level, subject–based measures of ICT correlate more strongly with relative gain scores than do overall ICT measures while the reverse obtains at the school level

(5) For the most part, pairings of Key Stage and subject that show the highest correlations reflect the pairings that emerged in sections 5, 7, and 9. Mathematics at Key Stage 2 is an exception, especially at the school level.

Some of the interpretation of these points must be tentative. (1) and the first part of (5) would be expected so long as the calculations are correctly carried out, and (2) has already been noted as reflecting a feature that is fundamental in any consideration of statistics. (3) and (4) are more challenging. Two interpretations are possible, and both may be correct. The “scores” that contribute to correlations are means for a school, while pupil scores are individual. Individual interests vary, even in one class, and this could result in a tendency for pupils not only to do better in a subject that interests them, but also to over-estimate the relative quality of their learning experiences in relation to these same subjects. At the school level these effects are random and tend to cancel out. So correlations between school means will actually be higher, and still reflect the pairings of subject and key-stage (dependent on the differing ICT emphases of the different schools). Pupil correlations reflect individual interests more than they do the ethos of the school. Conversely, school means reflect the ethos of the school, its commitment to ICT, and so forth. These tend to cross subject boundaries, and if that is so, it would account for the otherwise puzzling reversal noted as (4).

Appendix 3: The special schools

The range of the five special schools selected to participate was quite diverse and included schools providing support for pupils with emotional and behavioural difficulties (EBD), moderate learning difficulties (MLD), severe learning difficulties (SLD), profound learning difficulties (PLD) and deaf children. Some relevant statistics are shown in the following table.

Table 4.1 Computer resources in five ImpaCT2 special schools at the conclusion of the project (July 2001)

Pseudonym of School	Staff	Pupils	Comps	Ratio	NT	Internet	Link	Lap tops	Wire less
Abbey Lane	11	52	9	5.78	9	9	ISDN	2	0
Forest Dean	10	69	29	2.38	24	24	Phone	2	0
Hollybank	8	64	35	1.83	35	35	ISDN	2	0
Orchard Park	6	76	7	10.86	3	3	ISDN	2	2
Woodland Way	45	203	60	3.38	60	60	ISDN	0	0
Totals	80	464	140		131	131		8	2
Means	27	155	47	3.31	44	44		2.7	0.67

The main points that emerged from visits to these schools follow.

(1) Because of the wide variation the needs of the pupils concerned, the educational process must be more tailored to the individual than it is – or can be- in mainstream schools. Many will be coping with multiple handicaps, which may include some measure of brain damage in one or both hemispheres. Despite this or because of this ICT has been found helpful a number of ways.

(2) Standalone software can be tailored to suit the needs of individual learners and can provide repetition in a safe, private learning environment so that pupils can gain an experience of success, thereby boosting their own confidence, their self-esteem and their motivation to learn as well as the time they are willing to spend on the same task

(3) ICT can also be used to develop fine motor skills and visual skills for pupils with a range of learning difficulties.

(4) The uses of networked technologies tend to be more problematic. Teachers of pupils with learning difficulties found that the benefits of Internet and email were limited, particularly with younger pupils (although it was noted as being motivational for post-16 pupils). The language used on websites is often inappropriate when many of these pupils have low literacy skills.

(5) Nevertheless, as online resources increase and develop for areas such as early years in mainstream education, there should be more opportunities for these pupils to use the Internet to access forms of information more suited to their particular needs. Likewise it should be possible to use Email to converse with appropriate audiences who are aware of the needs of these learners Such developments will help to develop communication skills in a purposeful and meaningful way.

(6) For pupils with emotional and behavioural difficulties the benefits of networked ICT are less ambiguous. Pupils at two schools had a strong interest in ICT and the Internet and were motivated to use these resources to support school-work and to pursue personal interests. At one of these schools, substantial use was made of Integrated Learning Systems although not all pupils engaged positively with this environment. However, in this same school, ICT was also used to support personal and social development and was highly regarded. Thus it had proved successful to date in supporting anger management.

(7) Chat rooms facilitated communication in a safe and private environment, enabling pupils to exert control over how they presented themselves and with whom they communicated. These pupils

were also extremely motivated when they used the Internet for research, because they found how they could engage instantly with information that was up to date and relevant. Thus for EBD pupils, both networked technologies and standalone programs have provided a truly value-added resource, particularly in relation to the affective domain.

(8) Pupils with hearing difficulties generally require extra classroom time to develop oral language skills which tends to make it difficult to integrate the ICT to support teaching and learning. Networked technologies do have the potential to reduce the communication barriers experienced by these pupils so that they can collaborate with pupils in mainstream education on an equal footing, but to date there have been few opportunities to exploit that potential. Thus, in the school for hearing impaired these problems might have been overcome more easily had there been headphone systems in the ICT suites and library to enable direct communication between teacher and pupils.

(9) In the same school, however, a move to more vocational qualifications is leading to increased demands for ICT. In addition, pupils make good use of standard ICT packages particularly in KS4 where a large percentage of coursework is produced using these tools. For these pupils, whose written language skills are weak because of the weakness of their oral language skills, the benefits of spelling and grammar checkers are of paramount importance. In addition, research tasks are often set for 'prep time'. Here again, however, some teachers had concerns about the appropriateness of language used on some websites and some teachers believed that pupils experienced difficulties in using search engines. On the other hand, the pupils did not express similar concerns and seemed to be confident users of the Internet. For schools such as this, due to the emphasis on oral language development in the classroom, it may be a more challenging task to encourage and develop positive staff attitudes to ICT than it is for mainstream schools.

(10) There was little evidence of the use of ICT to support high achievers in mainstream schools and this was not a major line of enquiry within this evaluation. Nevertheless some teacher researchers did comment on this aspect and made the following points:- firstly, tasks could be extended, enabling these pupils to be challenged and engage with higher order thinking skills; secondly, pupils could progress at their own pace instead of being held back and feeling de-motivated; thirdly they could work collaboratively with peers from other schools and with experts in the field; and finally, they could have access to far more varied sources of information.

Appendix 4: Glossary

E-mail (electronic mail) – text messages and computer files exchanged through computer communication, via Internet or intranet networks.

Information and Communications Technologies (ICT) – Computing and communications facilities and features that support teaching, learning and a range of activities in education (such as administration). The focus is on the subject being taught or studied, or the organisation being administered, rather than developing pupils' skills with and knowledge of the technologies themselves. (Information Technology – IT – comprises the knowledge, skills and understanding needed to use ICT appropriately and effectively).

Internet – the connection of a very large number of computer networks, using a wide range of telecommunications (such as telephone lines) to provide a means of the exchange of information across the globe. For an individual user to access the Internet (or be 'online'), their computer must be connected to a local network which in turn has a connection to the Internet. The Internet is not the same as the World Wide Web (though the terms are frequently and erroneously used interchangeably). The World Wide Web (WWW, or just 'the Web') is one of the main types of service available via the Internet (other well-known services include e-mail, bulletin boards and file transfer). It refers to the collection of information held in multimedia form on the Internet. Most Internet resources are accessed using the Web, by providers making their information available as a Web site.

Intranet – a communications network, based on the same technologies used for the Internet (for example, the pages look like Web sites), but only available to authorised users within an organisation or company. It is used to share information, resources and services within the organisation.

ISDN – Integrated Services Digital Network, a standard method of transmitting digital data over a telephone network at high speeds, faster than a normal modem.

Modem – a communications device that allows data to be sent over standard telephone lines by converting binary signals from a computer into analog sound signals.

Networked technologies – the hardware and systems necessary for computer users to access networked and online applications as found on the Internet and intranets. More specifically:

(a) the use of computers for communicating with others (for example using e-mail, video-conferencing, Internet based discussion 'rooms' etc.) *and/or*

(b) the exploration and/or creation of Internet/World Wide Web resources (for example via the Internet 'proper' or via the school Intranet or other 'walled garden' environment etc.) *and/or*

(c) the use of a school-based or other local network for the retrieval, storage or exchange of information (for example storing and retrieving work files on/from the school server, using a shared data area for collaborative project etc).

New Opportunities Fund (NOF) training – The New Opportunities Fund provides National Lottery funding for education, health and environment projects. The aims of the Fund's ICT training programme are to raise the standards of pupils' achievements by increasing the expertise of serving teachers inn the use of ICT in subject teaching to the level of Newly Qualified Teachers (NQT's), and to improve the competence and confidence of school librarians in their use of ICT.

PIPS – Performance Indicators in Primary Schools project. PIPS is one of a family of information systems offered by the Curriculum, Evaluation and Management Centre (CEM Centre) at the University of Durham. PIPS gathers data on individual pupils as they move through the primary sector. This is processed at Durham and the results passed back to schools, allowing them to look objectively at the progress and attitudes of individual pupils, but also the performance of the school compared to thousands of others. Further information is available at: www.cem.dur.ac.uk.

Socio-economic status (SES) groups – These are based on a widely used classification system of the adult population according to occupation. The classification system as used during this study has now been replaced by an updated version. Sometimes called SEG - Socio-Economic Groups.

Thin client - Thin client networking allows applications (for example office and curriculum software) and data (for example, files) to be hosted centrally on a server, rather than on each individual computer

(client) on the network. Each computer (thin client) connects to the server via a network to run applications, access files and locate information, but does not store information locally. A thin client is normally configured with only the essential equipment such as a central processing unit (CPU), limited memory, keyboard and monitor. It is most often devoid of a hard drive, CD-ROM player, diskette drive and expansion slots. The software is therefore delivered, configured and controlled from the server. The purpose is to limit the capabilities of these computers to essential applications, hence the term *thin.* This ensures that users do not have redundant computing power on their desks and that administration is centralised.

YELLIS – The Year Eleven Information System is a 'value-added' information system that provides a wide range of performance indicators for pupils aged 14-16. The value-added approach allows for comparisons between pupils participating in the YELLIS project. As with PIPS, this is managed by the Curriculum, Evaluation and Management Centre (CEM Centre) at the University of Durham. Further information is available at: www.cem.dur.ac.uk.

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The main enquiry was led by Colin Harrison and includes:

Tony Fisher - University of Nottingham

Kaye Haw - University of Nottingham

Eric Lunzer - University of Nottingham

Cathy Lewin - Open University

Peter Scrimshaw - Open University

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Di Mavers - Manchester Metropolitan University

Bridget Somekh - Manchester Metropolitan University

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Sue Cavendish - University of Leicester

Chris Comber - University of Leicester

Tony Lawson – University of Leicester

Rhona McEune – University of Leicester

Fred Paterson – University of Leicester

Rob Watling - University of Leicester

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Appendix 5: Data collection instruments used in Strands 1 and 2

ImpacT2 : Concept Mapping Task

Task for teachers (in two parts). Total time, including introduction: 40 minutes.

Introduction

(Time allowed for introduction: 5 minutes. Use these words. Don't change the words because that will change the task.)

ImpacT2 is investigating the impact of new technology on pupils' learning. The focus of our work is, therefore, on your pupils (particularly in years 5-6, 8-9 and 10-11 during 2000-2001). However, because teachers have a big influence on the way that pupils come to understand and learn, it would help the ImpacT2 researchers greatly if you could spend half an hour doing this 'task' for us. It is important that you write your name on the paper, so that we can link your ideas with any discussions we might have with you in the future. However, we guarantee that your work will be kept confidential and your name will not be quoted in any reports we write.

So first I'm going to tell you what we want you to do

The task is in two parts: in part one you are asked to produce a concept map and in part two you are asked to write about it. Concept maps are a means of representing your ideas graphically – you are making a map of your ideas to show how they are linked in your mind. We want you to make this a very 'concrete' concept map so please create the 'nodes' by drawing an object or writing a word in a box to represent an object. We don't want you to follow any particular rules. You could start with one main node, or two, or more… Then you show how these objects ('nodes') are linked to each other by drawing lines between them. If you want to show that the link is only one way you can add a directional arrowhead. You can have as many nodes and as many links as you like. Don't spend too long thinking about it, because the order is not important. We want a rough impression of your ideas, so just start mapping and see where your ideas take you. There may be lots of links and they may cross each other and begin to look messy. That's fine. The end product is supposed to show how you think rather than being an object of beauty!

Part one: producing a concept map

(Note for teacher/researcher administering the task:

- Time allowed - 20 minutes
- Large sheets of A3 white paper (297 x 420 mm)
- Black pens or pencils)

Please produce a concept map on the A3 sheet of paper, to show your own personal mind map of the role of computers in your life today. Think of all the places where you find computers and all the things that they do, how they link with each other and why. Try to include all of this in your concept map.

For the 'nodes' of your concept map you can either draw an object or write a word in a box to represent an object.

You should draw links between the objects to show how they are connected in your mental representation. You can label these links with one or two words to show the relationships between the objects if you want to. Links between objects will be assumed to be in both directions unless you add a directional arrowhead.

You have 20 minutes to produce the concept map. Please do this on your own as we want to find out how much variety there is between all all our representations of ICT (i.e. ImpacT2 team members, teacher-researchers and other teachers in participating schools).

Part two: writing

(Note for teacher/researcher administering the task:

- Time allowed - 15 minutes
- A4 paper

Please write a short piece explaining: (1) what you see as the most important uses of computer systems in present-day society; (2) what you see as the advantages and disadvantages for us all, and (3) what changes you imagine computer systems may bring to our lives over the next five to ten years.

Final instruction at the end:

Thanks so much for making this contribution to the work of ImpacT2. Please write your name on both papers before handing them in.

Pupil Questionnaire Y11

Date: _____ School: _____

First Name: _____ Last Name: _____

Home Postcode: _____

If you are not sure how to answer any questions, it's OK to ask your teacher for help.

On this page please circle one answer for each question.

Do you have a games console at home? Yes / No
(For example Sega, Nintendo, Sony Playstation)

Do you have a computer at home? Yes / No

Can you access the Internet from home? Yes / No

Do you use computers in places other than your own home or school (for example the library, an Internet café, a friend's house or somewhere else)? Yes / No

Can you access the Internet from these computers in places other than your own home or school? Yes / No

Do you have an email address? Yes / No

Have you ever created your own web page? Yes / No

Do you have your own mobile phone? Yes / No

Do you use the Internet for visiting GCSE revision sites? Yes / No
(eg. Bytesize)

What kinds of things do you use computers for that are

FOR YOUR OWN INTEREST

These questions are about the kinds of things that you do with computers **outside lesson time** for activities that are **for your own interest**. Do not include computer use for school work.

For example you might be sending emails to your friends or finding out about something that interests you. Outside lesson time includes lunchtime, free lessons, after school club, at home, at friends' homes, in an Internet café or in a library.

Below are some statements about how you use computers **for your own interest**.

Please tick one box for each statement.

	Every day or most days	At least once a week	At least once a month	Sometimes	Never
I play electronic games (on a games console or computer)	❑	❑	❑	❑	❑
I surf the Internet	❑	❑	❑	❑	❑
I download files from the Internet (eg. music or pictures or software)	❑	❑	❑	❑	❑
I send emails	❑	❑	❑	❑	❑

I use the computer to visit Internet chat rooms	❑	❑	❑	❑	❑
I use the computer to videoconference	❑	❑	❑	❑	❑
I use computers for personal writing (e.g. letters to friends, diaries, stories or poems)	❑	❑	❑	❑	❑
I use computers for desktop publishing (e.g. birthday cards, posters, invitations or newsletters)	❑	❑	❑	❑	❑

How often do you use ICT for school work in lesson time?

This page is about how often you use ICT **FOR SCHOOL WORK in lesson time** for each GCSE subject that you do.

Please tick one box for each subject about how often you have used ICT for school work **in lesson time** during this school year (since September 2000).

GCSE subject	Every week	Most weeks	Some weeks	Hardly ever	Never
English	❑	❑	❑	❑	❑
Mathematics	❑	❑	❑	❑	❑
Science (Single Award)	❑	❑	❑	❑	❑
Science (Double Award)	❑	❑	❑	❑	❑
Chemistry (Separate Award)	❑	❑	❑	❑	❑
Physics (Separate Award)	❑	❑	❑	❑	❑
Biology (Separate Award)	❑	❑	❑	❑	❑
French	❑	❑	❑	❑	❑
Other Modern Language	❑	❑	❑	❑	❑
Geography	❑	❑	❑	❑	❑
History	❑	❑	❑	❑	❑

Religious Instruction	❑	❑	❑	❑	❑
Art	❑	❑	❑	❑	❑
Music	❑	❑	❑	❑	❑
Design and Technology	❑	❑	❑	❑	❑
Information Technology	❑	❑	❑	❑	❑
Other: (please specify)	❑	❑	❑	❑	❑
Other: (please specify)	❑	❑	❑	❑	❑

What kinds of ICT activities have you done for school work in school lesson time.

This page is about what kinds of activities you have done with ICT **FOR SCHOOL WORK in school lesson time** for each GCSE subject that you do.

Please tick all boxes that apply for each subject area.

You may not have done any of the kinds of activity that are in the table in one or more of your subjects. If so, you can tick the box saying that you have not used them.

Which of the kinds of activity using computers have you done in each subject during the last school year for school work **in school lesson time** (from September 2000)?

GCSE subject	Sending/ receiving emails	Finding information on the Internet	Creating web pages	Using discussion rooms or chat rooms	Using video-conferencing	None of these
English	❑	❑	❑	❑	❑	❑
Mathematics	❑	❑	❑	❑	❑	❑
Science (Single Award)	❑	❑	❑	❑	❑	❑
Science (Double Award)	❑	❑	❑	❑	❑	❑
Chemistry (Separate Award)	❑	❑	❑	❑	❑	❑
Physics (Separate Award)	❑	❑	❑	❑	❑	❑
Biology (Separate Award)	❑	❑	❑	❑	❑	❑
French	❑	❑	❑	❑	❑	❑
Other Modern Language	❑	❑	❑	❑	❑	❑
Geography	❑	❑	❑	❑	❑	❑
History	❑	❑	❑	❑	❑	❑

Religious Instruction	❑	❑	❑	❑	❑	❑
Art	❑	❑	❑	❑	❑	❑
Music	❑	❑	❑	❑	❑	❑
Design and Technology	❑	❑	❑	❑	❑	❑
Information Technology	❑	❑	❑	❑	❑	❑
Other: (please specify)	❑	❑	❑	❑	❑	❑
Other: (please specify)	❑	❑	❑	❑	❑	❑

How often do you use ICT for school work in school at lunchtime, break, free periods or after school?

This page is about how often you use ICT **FOR SCHOOL WORK in school at lunchtime, break, free periods or after school** for each GCSE subject that you do.

Please tick one box for each subject about how often you have used ICT for school work **in school at lunchtime, break, free periods or after school** during this school year (since September 2000).

GCSE subject	Every week	Most weeks	Some weeks	Hardly ever	Never
English	❑	❑	❑	❑	❑
Mathematics	❑	❑	❑	❑	❑
Science (Single Award)	❑	❑	❑	❑	❑
Science (Double Award)	❑	❑	❑	❑	❑
Chemistry (Separate Award)	❑	❑	❑	❑	❑
Physics (Separate Award)	❑	❑	❑	❑	❑
Biology (Separate Award)	❑	❑	❑	❑	❑
French	❑	❑	❑	❑	❑
Other Modern Language	❑	❑	❑	❑	❑
Geography	❑	❑	❑	❑	❑
History	❑	❑	❑	❑	❑
Religious Instruction	❑	❑	❑	❑	❑
Art	❑	❑	❑	❑	❑
Music	❑	❑	❑	❑	❑
Design and Technology	❑	❑	❑	❑	❑

Information Technology	❑	❑	❑	❑	❑
Other: (please specify)	❑	❑	❑	❑	❑
Other: (please specify)	❑	❑	❑	❑	❑

What kinds of ICT activities have you done for school work in school at lunchtime, break, free periods or after school.

This page is about what kinds of activities you have done with ICT **FOR SCHOOL WORK in school at lunchtime, break, free periods or after school** for each GCSE subject that you do.

Please tick all boxes that apply for each subject area.

You may not have done any of the kinds of activity that are in the table in one or more of your subjects. If so, you can tick the box saying that you have not used them.

Which of the kinds of activity using computers have you done in each subject during the last school year (from September 2000) for school work **in school at lunchtime, break, free periods or after school**?

GCSE subject	Sending/ receiving emails	Finding information on the Internet	Creating web pages	Using discussion rooms or chat rooms	Using video-conferencing	None of these
English	❑	❑	❑	❑	❑	❑
Mathematics	❑	❑	❑	❑	❑	❑
Science (Single Award)	❑	❑	❑	❑	❑	❑
Science (Double Award)	❑	❑	❑	❑	❑	❑
Chemistry (Separate Award)	❑	❑	❑	❑	❑	❑
Physics (Separate Award)	❑	❑	❑	❑	❑	❑
Biology (Separate Award)	❑	❑	❑	❑	❑	❑
French	❑	❑	❑	❑	❑	❑
Other Modern Language	❑	❑	❑	❑	❑	❑
Geography	❑	❑	❑	❑	❑	❑
History	❑	❑	❑	❑	❑	❑
Religious Instruction	❑	❑	❑	❑	❑	❑
Art	❑	❑	❑	❑	❑	❑
Music	❑	❑	❑	❑	❑	❑
Design and Technology	❑	❑	❑	❑	❑	❑
Information Technology	❑	❑	❑	❑	❑	❑

Other: (please specify)	❑	❑	❑	❑	❑	❑
Other: (please specify)	❑	❑	❑	❑	❑	❑

How often do you use ICT for school work **outside school**?

This page is about how often you use ICT **FOR SCHOOL WORK outside school (for example at home, in the public library, at a friend's house or somewhere else)** for each subject that you do (for English, Maths, Science and other lessons).

Please tick one box for each subject about how often you have used ICT for school work **outside school** during this school year (since September 2000).

GCSE subject	Every week	Most weeks	Some weeks	Hardly ever	Never
English	❑	❑	❑	❑	❑
Mathematics	❑	❑	❑	❑	❑
Science (Single Award)	❑	❑	❑	❑	❑
Science (Double Award)	❑	❑	❑	❑	❑
Chemistry (Separate Award)	❑	❑	❑	❑	❑
Physics (Separate Award)	❑	❑	❑	❑	❑
Biology (Separate Award)	❑	❑	❑	❑	❑
French	❑	❑	❑	❑	❑
Other Modern Language	❑	❑	❑	❑	❑
Geography	❑	❑	❑	❑	❑
History	❑	❑	❑	❑	❑
Religious Instruction	❑	❑	❑	❑	❑
Art	❑	❑	❑	❑	❑
Music	❑	❑	❑	❑	❑
Design and Technology	❑	❑	❑	❑	❑
Information Technology	❑	❑	❑	❑	❑
Other: (please specify)	❑	❑	❑	❑	❑
Other: (please specify)	❑	❑	❑	❑	❑

What kinds of ICT activities have you done for school work outside school.

This page is about what kinds of activities you have done with ICT **FOR SCHOOL WORK outside school** for each GCSE subject that you do.

Please tick all boxes that apply for each subject area.

You may not have done any of the kinds of activity that are in the table in one or more of your subjects. If so, you can tick the box saying that you have not used them.

Which of the kinds of activity using computers have you done in each subject during the last school year (from September 2000) for school work outside school?

GCSE subject	Sending/ receiving emails	Finding information on the Internet	Creating web pages	Using discussion rooms or chat rooms	Using video-conferencing	None of these
English	❑	❑	❑	❑	❑	❑
Mathematics	❑	❑	❑	❑	❑	❑
Science (Single Award)	❑	❑	❑	❑	❑	❑
Science (Double Award)	❑	❑	❑	❑	❑	❑
Chemistry (Separate Award)	❑	❑	❑	❑	❑	❑
Physics (Separate Award)	❑	❑	❑	❑	❑	❑
Biology (Separate Award)	❑	❑	❑	❑	❑	❑
French	❑	❑	❑	❑	❑	❑
Other Modern Language	❑	❑	❑	❑	❑	❑
Geography	❑	❑	❑	❑	❑	❑
History	❑	❑	❑	❑	❑	❑
Religious Instruction	❑	❑	❑	❑	❑	❑
Art	❑	❑	❑	❑	❑	❑
Music	❑	❑	❑	❑	❑	❑
Design and Technology	❑	❑	❑	❑	❑	❑
Information Technology	❑	❑	❑	❑	❑	❑
Other: (please specify)	❑	❑	❑	❑	❑	❑
Other: (please specify)	❑	❑	❑	❑	❑	❑

NOW CHECK ALL YOUR ANSWERS CAREFULLY PLEASE!

Date: _____ School: _____

First Name: _____ Last Name: _____

Please write down your home Postcode: _____

If you are not sure how to answer any questions, it's OK to ask your teacher for help.

On this page please circle one answer for each question.

Do you have a games console at home? Yes / No
(For example Sega, Nintendo, Sony Playstation)

Do you have a computer at home? Yes / No

Can you access the Internet from home? Yes / No

Do you use computers in places other than your own home or school (for example the library, an Internet café, a friend's house or somewhere else)? Yes / No

Can you access the Internet from these computers in places other than your own home or school? Yes / No

Do you have an email address? Yes / No

Have you ever created your own web page? Yes / No

Do you have your own mobile phone? Yes / No

Do you use the Internet for visiting National Test Revision Sites? Yes / No

What kinds of things do you use computers for that are

FOR YOUR OWN INTEREST

These questions are about the kinds of things that you do with computers **outside lesson time** for activities that are **for your own interest**. Do not include computer use for school work.

For example you might be sending emails to your friends or finding out about something that interests you. Outside lesson time includes lunchtime, free lessons, after school club, at home, at friends' homes, in an Internet café or in a library.

Below are some statements about how you use computers **for your own interest**.

Please tick one box for each statement.

	Every day or most days	At least once a week	At least once a month	Sometimes	Never
I play electronic games (on a games console or computer)	❑	❑	❑	❑	❑
I surf the Internet	❑	❑	❑	❑	❑
I download files from the Internet (eg. music or pictures or software)	❑	❑	❑	❑	❑
I send emails	❑	❑	❑	❑	❑
I use the computer to visit Internet chat rooms	❑	❑	❑	❑	❑
I use the computer to videoconference	❑	❑	❑	❑	❑

I use computers for personal writing (e.g. letters to friends, diaries, stories or poems)	❑	❑	❑	❑	❑
I use computers for desktop publishing (e.g. birthday cards, posters, invitations or newsletters)	❑	❑	❑	❑	❑

How do you use ICT for school work in Maths?

In the first table please tick one box for each subject about how often you have used ICT **for school work in Maths** during this school year (since September 2000).

You might use ICT

- in school in lesson time
- in school, outside lessons: at lunchtime, break, free lessons or after school
- outside school: at home, a friend's house, the library or somewhere else

	Every week	Most weeks	Some weeks	Hardly ever	Never
In lesson time	❑	❑	❑	❑	❑
In school, outside lessons	❑	❑	❑	❑	❑
Outside school	❑	❑	❑	❑	❑

In the second table please tick all boxes that apply (it can be more than one on each line).

You may not have done any of the kinds of activity that are in the table. If so, you can tick the box saying none of these.

Which of the kinds of activity using computers have you done for **Maths** during the last school year (from September 2000) in each of the three places that you might do school work?

	Sending emails	Finding information on the	Creating web pages	Using Internet chat rooms	Using video-conferencin	None of these

		Internet			g	
In lessons	❑	❑	❑	❑	❑	❑
In school, outside lessons	❑	❑	❑	❑	❑	❑
Outside school	❑	❑	❑	❑	❑	❑

How do you use ICT for school work in English?

Now you are going to answer the same questions but this time about the subject **English.**

In the first table please tick one box for each subject about how often you have used ICT **for school work in English** during this school year (since September 2000).

You might use ICT

- in school in lesson time
- in school, outside lessons: at lunchtime, break, free lessons or after school
- outside school: at home, a friend's house, the library or somewhere else

	Every week	Most weeks	Some weeks	Hardly ever	Never
In lesson time	❑	❑	❑	❑	❑
In school, outside lessons	❑	❑	❑	❑	❑
Outside school	❑	❑	❑	❑	❑

In the second table please tick all boxes that apply (it can be more than one on each line).

You may not have done any of the kinds of activity that are in the table. If so, you can tick the box saying none of these.

Which of the kinds of activity using computers have you done for **English** during the last school year (from September 2000) in each of the three places that you might do school work?

	Sending	Finding information	Creating web	Using Internet	Using video-	None of

	emails	on the Internet	pages	chat rooms	conferencing	these
In lessons	❑	❑	❑	❑	❑	❑
In school, outside lessons	❑	❑	❑	❑	❑	❑
Outside school	❑	❑	❑	❑	❑	❑

How do you use ICT for school work in Science?

Now you are going to answer the same questions but this time about the subject **Science.**

In the first table please tick one box for each subject about how often you have used ICT **for school work in Science** during this school year (since September 2000).

You might use ICT

- in school in lesson time
- in school, outside lessons: at lunchtime, break, free lessons or after school
- outside school: at home, a friend's house, the library or somewhere else

	Every week	Most weeks	Some weeks	Hardly ever	Never
In lesson time	❑	❑	❑	❑	❑
In school, outside lessons	❑	❑	❑	❑	❑
Outside school	❑	❑	❑	❑	❑

In the second table please tick all boxes that apply (it can be more than one on each line).

You may not have done any of the kinds of activity that are in the table. If so, you can tick the box saying none of these.

Which of the kinds of activity using computers have you done for **Science** during the last school year (from September 2000) in each of the three places that you might do school work?

	Sending emails	Finding information on the Internet	Creating web pages	Using Internet chat rooms	Using video-conferencing	None of these
In lessons	❑	❑	❑	❑	❑	❑
In school, outside lessons	❑	❑	❑	❑	❑	❑
Outside school	❑	❑	❑	❑	❑	❑

How do you use ICT for school work in other subjects?

Now you are going to answer the same questions but this time about all the other subjects that you do except English, Maths and Science (for example, Geography, History or IT)**.**

In the first table please tick one box for each subject about how often you have used ICT **for school work in other subjects** during this school year (since September 2000).

You might use ICT

- in school in lesson time
- in school, outside lessons: at lunchtime, break, free lessons or after school
- outside school: at home, a friend's house, the library or somewhere else

	Every week	Most weeks	Some weeks	Hardly ever	Never
In lesson time	❑	❑	❑	❑	❑
In school, outside lessons	❑	❑	❑	❑	❑
Outside school	❑	❑	❑	❑	❑

In the second table please tick all boxes that apply (it can be more than one on each line).

You may not have done any of the kinds of activity that are in the table. If so, you can tick the box saying none of these.

Which of the kinds of activity using computers have you done for **other subjects** during the last school year (from September 2000) in each of the three places that you might do school work?

	Sending emails	Finding information on the Internet	Creating web pages	Using Internet chat rooms	Using video-conferencing	None of these
In lessons	❑	❑	❑	❑	❑	❑
In school, outside lessons	❑	❑	❑	❑	❑	❑
Outside school	❑	❑	❑	❑	❑	❑

NOW CHECK ALL YOUR ANSWERS CAREFULLY PLEASE!

Questionnaire to be returned to:

ImpaCT2 Project Secretary

School of Education

The University of Nottingham

Log

Name:

Year:

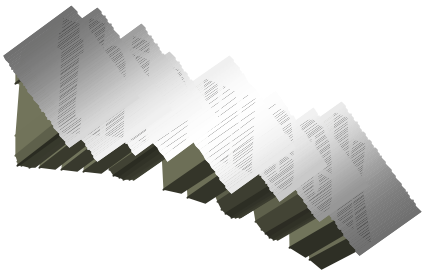
School:

Week beginning:

please fill in each page every day for one week

	What did you do on the computer at school today?	What did you use? (e.g. word processing, Internet, CD-Rom, Roamer)	How long did you have?
Monday			
Tuesday			
Wednesday			
Thursday			
Friday			
	What did you do on the computer at home today?	What did you use? (e.g. drawing, email, CD-Rom, game)	How long did you have?
Monday			

Tuesday			
Wednesday			
Thursday			
Friday			
Saturday			
Sunday			



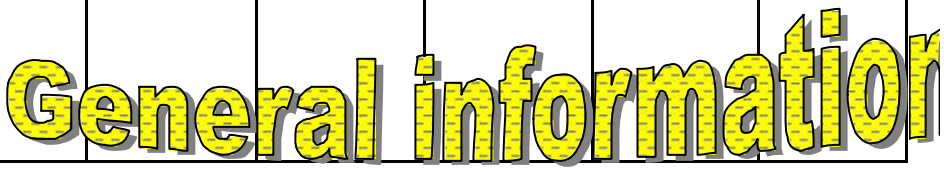
Things I have used this week

Please enter how long you have spent doing these things this week. Please remember to use the chart every day.

	At school	Out of school		At school	Out of school
Word processing			*Email*		
Desktop publishing			**Websites**		
Art packages			**Chat rooms**		
Music			**Web cam**		
Spreadsheets			**Digital camera**		
Database			**Scanner**		
Logo			**Roamer**		
Datalogging			**Maths games**		
CD-Rom			**Spelling games**		

Please enter how long you have spent doing these things this week. Please remember to use the chart every day.

	Playing hand-held electronic games	Playing games on a console (attached to the television)	Watching the television	Watching videos	Listening to CDs	Listening to music on a walkman	Using a mobile phone
Monday							
Tuesday							
Wednesday							
Thursday							
Friday							
Saturday							
Sunday							



Do you use the computer for your homework?	Often		Sometimes		Hardly ever	
If you use the computer for homework, what do you do?						

What sort of computer do you use at school?						
What computer do you use at home?						
Do you play on the computer when you go round to your friends' houses?	Often		Sometimes		Hardly ever	
If you go on the computer at a friend's house, what do you do?						

On the computer, which things do you find most helpful for your schoolwork? Please put them in order from 1 (the most useful) to 5.	On the computer, which things do you enjoy using most in your own time? Please put them in order from 1 (your very favourite) to 5.
1.	1.
2.	2.
3.	3.
4.	4.
5.	5.

Thank you for your hard work in completing this Log. Your contributions are much appreciated.

Log

Aim: to track computer use over a typical week

Name:

Year:

School:

Week beginning:

!!! Every time you use IT this week

you will need to time yourself and jot down how long you spent.

!!! Please each page of your Log every day for one week.

!!! Accurate information is vitally important.

Lessons this week

- Under the 'subject' heading please enter the lessons you have had at school this week.
- For each school day of the week please:
  - tally the number of lessons each day
  - tally computer use in those lessons.

Subject	**Monday**		**Tuesday**		**Wednesday**		**Thursday**		**Friday**		*Purpose of computer use*
	Lessons	IT use	Lessons	IT use	Lessons	IT use	Lessons	IT use	Lessons	IT use	

Homework this week

- Please enter the subjects you have had for homework this week.

- *Where you have used the computer for homework this week* please enter:
  - the homework subject you used the computer for
  - names, titles or website addresses of IT resources used for homework
  - total time spent on the computer doing homework in that subject this week
  - why you used the computer for your homework.

Subject	Software/CD/website	Duration	Purpose of use

Software used this week

Please enter:

- the amount of time you have spent using each application this week for schoolwork or your own interests (please update each day where appropriate).
- any additional software used in the space provided.

Software	**At school**		**Out of school**	
	Duration of use for schoolwork	Duration of use for your own interests	Duration of use for schoolwork	Duration of use for your own interests
Word processing				
Desktop publishing				
Multimedia authoring				
Art packages				
CAD/CAM				
Music				
Spreadsheets				
Database				
Logo				
Control				
Datalogging				
CD-Rom				

On-line use this week

Please enter:

- the amount of time you have spent using each on-line facility this week for schoolwork or your own interests (please update each day where appropriate).
- any additional software used in the space provided.

On-line use	At school		Out of school	
	Duration of use for schoolwork	Duration of use for your own interests	Duration of use for schoolwork	Duration of use for your own interests
Email				
Preparing email attachments (text, images or sound)				
Searching for and exploring websites (on-screen use)				
Searching for and downloading web information				
Processing transferred web information				
Creating web pages or a website				
Chat rooms				
Using web cam or video conferencing				

Leisure use this week

Please enter:

- the amount of time you have spent using each resource each day
- any additional electronic resources used for leisure this week in the space provided.

Resource	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
nd-held game							
ole attached to television							
Television							
Video							
ile phone (for ce messages)							
ile phone (for t messages)							
Hi-fi							
Walkman							
Pager							

General information

What sort of computer(s) do you use at school?	
What computer(s) do you use at home?	

Please tick which you have used	This week	This month	This year	Never
Electronic diary				
Hand-held computer (e.g. Psion)				
Digital camera				
Scanner				
Interactive whiteboard				

Generally speaking, which computer resources do you find most helpful for your schoolwork? Please rank.	Generally speaking, which computer resources do enjoy using most in your leisure time? Please rank.
1.	1.
2.	2.
3.	3.
4.	4.
5.	5.

Thank you for your help and co-operation in completing this Log. Your time and efforts are much appreciated.

Special Report

Name:

Age:

School:

Please choose a time when using the computer has helped with your school work.

This is not a test! Please tell us what you think.

Please describe exactly what you had to do.	

 I was… (please delete)	at school at home
I spent about ..... minutes on the computer.	

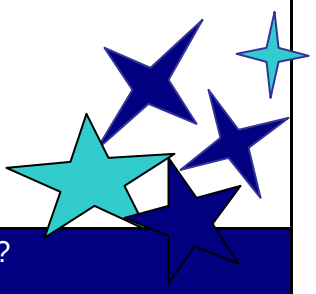
I was working with …

The software or website I used was...

Who told you to use the computer and this software? Or did you decide to use the computer?	

The most useful things about using the computer were…

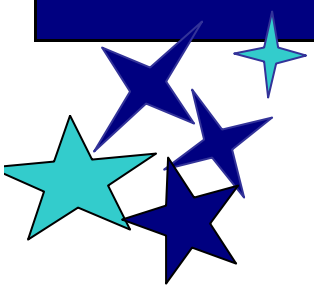
The things that were better or worse than using pen and paper or books were…



What did you learn that you did not know before?

How did it help you to understand better?

I …



Did you need help?

If so, when and why?

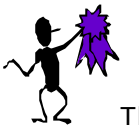
I was pleased with what I did because …

Anything you were not pleased about?

If you could invent some technology to help you do something special, what would it be?

You can type below or your teacher will give you a piece of A4 paper.

Please use drawing as well as writing.



Thank you very much for your time and effort.

Your help is much appreciated.

Special Report

Please reflect on an occasion when using the computer for

SCHOOL WORK

was particularly helpful.

This could be a piece of

homework, a class activity, a mini-project over a few weeks, coursework etc.

Please complete this report within 48 hours of the experience.

Please ensure quality time

to enable careful thought and the provision of detail.

Name:

Year:

School:

What was the subject focus?	
Please describe the exact nature of your task.	

Location		Room	

(e.g. home, school, local library)		(e.g. IT room, classroom, bedroom)	

Length of time spent on the task	
With whom were you working?	

Who told you to use the computer? Or did you decide yourself?	

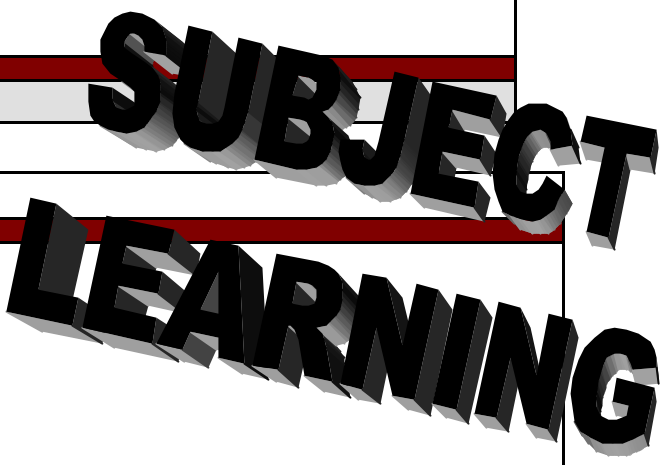
Precisely which software or website(s) did you use?	

Why did you select that particular resource?	
Which facilities in the software were particularly helpful and why?	

Please identify the benefits of using the computer rather than pen and paper or books for this task.

Please enter you response here.

Did you learn anything new about IT? If so, what?	



Please give details of where and how you acquired the knowledge and information to undertake the task. (e.g. teacher in class, parents, precise titles of books, websites or television programmes etc.)	

What did you discover about the subject that you did not know before? Did your understanding progress? If so, how?	*Please enter you response here.*

	Did you require assistance? If so, how was your problem resolved?
	

If you redid the task…	
what would you do the same next time?	

what would you change next time?	
Which aspects of the outcome were you pleased with?	
Did using the computer change your attitude to the task? If so, how?	

Please attach **a copy of your final outcome** (or a **particularly significant section**). If this was computer generated please print an extra copy. It if was done by hand please ask your teacher to photocopy it.

Please **annotate** the copy to show **where**, **what**, **how** and **why** use of the computer impacted the way you worked, your knowledge and understanding, and the quality of your work **in this particular task**.

Thank you very much for your time and effort in completing this questionnaire.

Your contributions are much appreciated.

ImpacT2

getting ready

First of all you will meet with your teacher
to find out more about ImpacT2
and what you will be doing as a researcher.

With your teacher you will talk about which people you will interview.

It's about using the Internet and computer games at home and mobile phones.

Please could you tell
the person
you are interviewing:

When you will meet.

Where you will meet.

interview

IMPORTANT!

- This is not a test.
- **ImpacT2 is trying to find out about what ICT children use at home and why.**
- What is said in the interview is private.
  Please do not discuss it with other people.
- You will send your tape and your report to a university researcher and the information will be used in the ImpacT2 project.

Before you interview the other person you will need to prepare the questions you would like to ask.

These are the things we would like you to find out about. Please decide what you think is interesting and important and make up your own questions.
ICT at home • **The Internet.** • **Mobile phones.** • **Computer games.** • **Rules about using IT at home.**

Please jot your ideas down here.

Please use this sheet to write out your questions in the order you think you might ask them.
If you would prefer to do this on the computer, that's fine.

Interviewing

instructions

Please make sure you have the things you need:

- these instructions
- your questions
- a pen or pencil (so that you can tick off which questions you have asked)
- a cassette recorder
- a blank cassette.

IMPORTANT!

- Please check that the cassette recorder is working properly (that it records and plays back).
- **Please ask:**

Are you happy for the interview to be recorded?

- **If it is okay, please make sure you** switch the cassette recorder on**.**
- Please explain what the interview is about.
- Please explain what ImpacT2 is and what your job is.
- Please read out these words:

- This cassette and the report will be sent to a university researcher.
- That person will listen to the tape and read the report.
- The information will be used to help the ImpacT2 team to find out about how we use computers at home.
- No names will be given in the project reports.

Only carry on if the person is happy and agrees.

Remember that it is okay to change your questions or add more during the interview.

writing your report

Please write up your report within 48 hours.

You can use the computer or write it by hand.

- At the top of the page, please write your name, age and school and the name and age of the person you have interviewed.
- Please listen carefully to your recording and write down what was said. Try to write down the person's exact words if you can.
- Please remember to include the questions you asked as well as what the other person said.
- Sometimes people think of things after the interview has finished. Please meet with the person you interviewed and give them your report. Tell the person that if there is anything they would like to change or add, please could they write it on a separate piece of paper.
- Please ask them to give it back within 24 hours.
- If you wish to make changes to your report when you get the comments back that is fine. If you do not, just attach the extra sheet of paper to the back of your report. If there were no changes, please jot down 'no changes' on the bottom of your report.
- Please read the report and list at the bottom the 3 things you think are most interesting.
- When you have finished, please put the cassette and your report in the envelope your teacher has given you. Seal the envelope and give it to your teacher who will send it to university researchers.
- This will be hard work.
  You may not be able to write the report all in one go.

interviewing

We hope you have enjoyed working as a researcher.

Thank you for your hard work.

ImpacT2

preparation

Thank you for volunteering to work as a pupil researcher in the ImapcT2 project.

At a briefing meeting with your teacher you will:

- find out more about ImpacT2
- discuss your role as a researcher
- explore interviewing procedures
- clarify report writing.

The focus of your interview is **what ICT young people use at home (or out of school) and why.** As a researcher, you will need to plan key questions for the interview. Below are the broad topics we would like you to focus on but it is important that you decide for yourself what is interesting and important within these areas.

- The Internet.

- Mobile phones
- Computer games.
- Rules about using ICT at home.

- You might like to start jotting your ideas down below.
- You will need to ask questions which get the person talking.
  - Once you have decided on the questions you think are important you will need to put them in a logical order.

If you would prefer to do this on the computer, that's fine.

interviewing

IMPORTANT!

- Interviewing is used to discover people's experience, attitudes, thoughts and ideas. It is not a test and there are no right answers.
- It is important that the person you are interviewing understands that the information he or she gives will be used as part of the ImpacT2 data. Permission for this must be obtained.
- What the person says to you in the interview is confidential and you must not discuss what was said with anyone else.
- The interview should last for approximately 20 minutes.

- Arrange where and when you will meet.
  Your teacher will advise you on this.

- Tell the person what to expect (that it is about home use of ICT, the Internet, mobile phones and electronic games; that the interview will be recorded; that the data will be used for the ImpacT2 project; that their permission will be needed).

- Before you start the interview, ensure that you have a blank cassette and test the equipment to ensure that it records and plays back.

- Make sure you have your questions sheet with you. Be ready to ask extra questions when you are actually in the interviewing situation.

interview preparation

the interview

- Please introduce yourself if you do not know the person very well.
- Please read out the following:

1. Are you happy for this interview to be recorded?
   If the person agrees please switch on the cassette recorder.
2. This interview is being conducted as part of the ImpacT2 project.
   Please explain what ImpacT2 is and what the interview is about.
3. This cassette and a report will be put in a sealed envelope. The teacher researcher will send it to a university researcher for analysis. University researchers will listen to the cassette and read the report. No names will be mentioned in ImpacT2's final report. Are you happy for what you say to be used by university researchers?

ONLY PROCEED

IF THE PERSON IS IN AGREEMENT WITH THIS

- Listen carefully to what the person says. Please ask further questions when you come across something interesting or something you would like to know more about.
- Sometimes things happen in a different order from how you had planned. Remember to check your questions sheet to make sure that you have not missed out any key issues.
- Explain that you will be giving your report to the person within 3 days to allow him or her to change or add anything as things can sometimes be forgotten in the interview itself.
- Remember to thank the person.

report writing

Please write up your report within 48 hours whilst the interview is still fresh in your mind. You can use the computer or write it by hand.

- At the top of the page, please write
  - your name, age and school
  - the name and age of the person you have interviewed.

- Please listen carefully to your recording and write down what was said.
  Pease remember to include the questions you asked as well as what the other person said.
  Try to write down exactly what the person said if you can.

- This may take time and you may not be able to do it all at once.

- When you have written up what was said please meet with the person you interviewed and give him or her your report. Tell the person that if there is anything he or she would like to change or add, please could this be written on a separate piece of paper.

- Please ask the person to give the report back within 24 hours.

- If you wish to make changes to your report when you get the comments back that is fine. If you do not, just attach the extra sheet of paper to the back of your report. If there were no changes, please jot down 'no changes' on the bottom of your report.

- Please read the report and list at the bottom the 3 things you think are most interesting.

- On completion, please put the cassette and the report in the envelope provided by your teacher and deal it up. Please give the envelope to your teacher who will post it to university researchers.

We hope you have enjoyed working as a researcher.

Thank you for your hard work.