The Secondary School of the Future

A Report to the DfEE by Becta
Published February 2001

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Introduction

This is the third in a series of reports on research being carried out by Becta that investigate the link between ICT and educational standards. Becta obtained and analysed data from a variety of sources, and we would like to thank Ofsted's Research, Analysis and International Division, Analytical Services at the DfEE, and QCA for their help in providing this data.

Professor David Reynolds has written the Foreword to this report. In it, he reviews the position of Becta's research work in relation to other ICT research and reflects on the need for further research into ICT practice.

This is a preliminary report, and it focuses on secondary school results and their use of ICT. It is preliminary because some of the conclusions need further clarification and analysis. It should be noted that there are interesting differences and similarities between the results at primary and secondary phases which Becta will explore, and this further work will be published in May 2001.

Owen Lynch
Chief Executive, Becta

Foreword

Countries around the world are investing large sums into ICT in schools and colleges, believing that it can transform both the learning outcomes from classrooms and, indeed, the whole nature of the child's educational experience. Great hopes are held worldwide for ICT, but thus far the research into whether ICT has effects, the appropriate utilisation of it, and 'what works' in terms of the balance between hardware, software and teacher input is an area of more assertion than evidence.

Such research as there has been internationally is of dubious validity, sometimes relying on studies of innovative persons and schools using ICT in which one is unsure of the extent to which any effects are because of the technology or the persons using it. The historic research is often on small samples, rarely controls out the effects of things other than ICT, and is rarely rigorous enough in its methodology or its search for explanations of findings to support the weight that has been put on it.

The research reported in this publication is different and sets new standards of methodological decency in this area of research. It is based on large samples, attempts to control out the effect of things other than ICT, such as the management and leadership quality of the school, and uses appropriate statistical methods. Usefully, it disaggregates schools into subject areas and shows an 'ICT effect' upon individual subjects. It also reports on detailed interview-based work with a large sample of headteachers, and has fascinating descriptions of the characteristics of, and possible effects of, the aptly named 'Schools of the Future' that score highly on their 'quantity' and 'quality' of ICT usage.

This research is not the last word. It is part of an ongoing programme of work that is attempting to unravel the complexities of ICT and its use. It is also intended to move existing research into further 'cutting edge' areas, by undertaking detailed case studies of the exemplary primary schools from this research study, and into the secondary system through looking at the ICT use within particularly effective departments.

Science rarely evolves because of one study in a particular area, of whatever quality it may be. Rather it is the accumulation of studies which point in the same direction that gives confidence to people that there is a 'truth' that has been discovered. When both the research reported here, and the views of large numbers of educational professionals, all point to the same conclusion that ICT can have positive effects on children's learning, it would be very foolish indeed to ignore this, or to ignore the implications of these findings, both educationally and economically, for practitioners, researchers, and policy makers.

Professor David Reynolds
University of Exeter

Introduction

Purpose

The purpose of this study was to analyse the relationship between ICT and secondary school standards (Key Stage 3 and GCSE) from a variety of sources, and identify whether they combine to provide evidence of a direct linkage between them.

In order to achieve this, Becta extended the analysis to include data from:

- Ofsted, who provided further information on 418 secondary schools inspected in 1998/9
- QCA, who provided mathematics, science and English standards for 1999 and 2000 for these schools
- The DfEE, who provided benchmarking data for these schools and data from the 'ICT in schools survey' for 714 secondary schools. Building on previous work examining evidence of a link between ICT and primary standards at Key Stage 2, this report looks at different elements of the causal chain linking ICT to standards:

Building on previous work examining evidence of a link between ICT and primary standards at Key Stage 2, this report looks at different elements of the causal chain linking ICT to standards:

- Do schools with better ICT resources which gained better results in 1999 continue to achieve better grades in the year 2000?
- If there is a difference in standards between schools with different ICT levels, is this difference still visible when comparing schools of the same type or pupil attainment level? This eliminates a possible secondary relationship that links ICT to 'Good' schools which is in turn, linked to pupil achievement.
- If there is a difference in standards between schools of the same type, is this difference related to the amount of subject usage? A link between subject usage of ICT and improved standards in that subject would provide strong evidence for a direct impact of ICT on pupils' learning.
- If there is a link between the amount of usage of ICT and improved standards, is the effect greater if ICT is used well? ICT is a learning tool and its impact should be dependent on the quality of its usage. If attainment is even higher when 'Good' ICT resource grades are combined with good use of ICT by teachers, this indicates a direct rather than an indirect link.
- If there is a clear link between ICT resource and standards, is there a linkage with other ICT measures? What is the pattern of the effects of factors such as ICT teaching, pupil ICT attainment and breadth of ICT in the curriculum?
- If there is an identifiable set of characteristics that represent good use of ICT, are these the characteristics of the 'school of the future'? What is the impact of ICT on standards in these schools?

Introduction

The research follows on from Becta's report on primary schools, 'Primary Schools of the Future - Achieving Today', published in January 2001. Generally, the findings show similar trends for ICT and standards to those found for primary schools for Key Stage 2; however, there are interesting differences between the results at primary and secondary level.

A key difference was that investigation of the social background of the 'schools of the future' showed that these are generally schools from the higher socio-economic and pupil prior attainment categories. A similar analysis for primary schools showed that the identified schools were similar in socio-economic mix to other schools. The result suggests the beginning of a 'digital divide' between more and less privileged schools in 1998/9 when this data was collected. This issue is being addressed through new initiatives which make funding available to less privileged schools. These schemes have offered increasing opportunities for schools in less privileged areas, and there is

evidence that schools are using these to increase their ICT resources, and to make better use of them.

This report does not cover all the ground included in the previous report on 'the primary school of the future' the issue of management quality is not covered, and we do not include the results of a telephone survey into the professional opinions of teachers and headteachers, nor a survey of academic research findings in this field. The analysis is based on whole school data, which hides differences in ICT resourcing and usage between different subject departments and key stages, and does not give us a clear picture of the experience of the individual pupil.

The number of secondary schools inspected during any year is relatively smaller (one fifth) than the number of primary schools, and once this is further subdivided for analysis, the samples become small. As a result, results can be influenced by random factors.

This preliminary analysis provides valuable insights into the linkage between ICT and standards in secondary schools, and is published to encourage and inform debate. Becta is working with Ofsted, researchers, and schools on further work to develop this analysis, and this will be published in a full report in May 2001.

Key findings and conclusions

Secondary schools with 'Very good' ICT resources achieved, on average, better results in the 1999 Key Stage 3 tests in English, mathematics and science than those with 'Poor' ICT resources. For instance:

- On average, in 1999, 77% of pupils in schools with 'Very good' ICT resources achieved level 5 or above in English, compared to 68% in schools with 'Poor' ICT resources (ref).

This difference was also true for Key Stage 4:

- On average, in 1999, 61% of pupils in schools with 'Very good' ICT gained five or more passes at Grade C GCSE or above, against 52% in 'Poor' ICT schools (ref).

This difference between standards is not seen when the results of schools with 'Good' ICT resources are compared with those of schools with 'Satisfactory' resources. This may indicate that there is a threshold level of ICT resource needed for effective use of ICT in supporting curriculum standards across a number of subjects. Further work identifying the way schools deploy their ICT resources will be carried out through school-based research.

The pattern of higher achievement in schools with 'Very good' ICT still holds in the 2000 test results. In 2000:

- 75% of pupils in schools in the same sample with 'Very good' resources achieved level 5 or above in English on average, in comparison with 69% for schools with 'Poor' resources.
- 62% of pupils in schools in the same sample with 'Very good' resources gained five or more passes at Grade C GCSE or above, against 55% for schools with 'Poor' resources.

Looking at socio-economic factors, when schools are compared to other schools with similar socio-economic banding, those with 'Good' ICT resources generally achieved better results in the 1999 Key Stage 3 tests and GCSE than schools with 'Unsatisfactory' ICT resources. This analysis was repeated for schools with the same level of prior pupil attainment and a similar result emerged.

Further evidence of the impact of ICT on standards is revealed when the data on subject attainment is examined in more detail. Schools that used ICT to support science and mathematics generally had better achievement in those subjects than schools that did not.

However, the impact of ICT on Key Stage 3 subject attainment was much stronger where the subject's use of ICT was supported by extensive use across the whole curriculum. Attainment in the three core subjects (English, maths and science) was highest in schools that used ICT to support that subject and at least four others. Schools that used ICT to support a subject at Key

Stage 3, but otherwise made very restricted use of ICT, did not show a consistent enhancement of subject attainment. This effect is particularly marked in English.

The 'ICT in Schools' survey data also shows that the more widely a school uses ICT across the subject curriculum, the better its GCSE results:

- On average 52% of pupils in schools using ICT to support a wide range of subjects achieved at least five GCSE Grade C passes compared to 44% in schools that used ICT substantially for four or fewer subjects.

The overall picture is that individual subject use at secondary level is enhanced by the use of ICT across the whole curriculum. It suggests that a whole-school policy of support across the curriculum is necessary, and that the development of pupils' ICT skills is transferable from subject to subject.

Analysis of the Ofsted data on quality of ICT use reveals that attainment is even higher when high levels of ICT resource are combined with 'Good' ICT teaching.

- On average 69% of pupils in schools with 'Very good' ICT resources attained at least five GCSEs. When 'Very good' resources are combined with 'Good' ICT teaching, this proportion rises to 72%.

This finding reinforces the need to link resources to training in ICT teaching and for better support for schools in their use of ICT. This finding was repeated for a number of different ICT factors. Similar positive effects are seen when 'Very good' ICT resources are combined with a good ethos for learning in ICT, or good use of ICT resources. In both cases pupil attainment rises.

In particular, there was a very strong link between pupils' ICT attainment and standards, both at Key Stage 3 and at GCSE.

- On average, 83% of pupils gained at least five GCSEs in schools where ICT skills were rated as 'Very good'. This proportion was 49% in schools where pupils had 'Unsatisfactory' ICT skills.

This large difference may be because pupils with 'Good' ICT skills are able to use these skills to support the higher order skills within subjects and to support independent learning, improving their own and the school's performance. A positive relationship is still seen even when socio-economic grade (which may be related to pupils' opportunity to develop ICT skills) is taken into account.

Finally, a number of 'secondary schools of the future' have been identified within the sample which combine 'Good' ICT resources and highly effective use of those resources. These 'schools of the future' were meeting the Government's 2004 targets in 1999.

- 80% of pupils in these 'schools of the future' reached level 5 or higher in maths and English at Key Stage 3.

Investigation of the social background of these schools shows that these are generally schools from the higher socio-economic and pupil prior attainment categories.

Section 1 - Attainment and ICT resourcing

1. Is attainment higher in schools with better ICT resources?

Ofsted inspectors assessed the 'adequacy of resources' to meet the demands of the ICT curriculum. This rating was a judgement covering the school as a whole, and thus did not relate to the quality of resources specifically available to either Key Stage 3 pupils or GCSE pupils.

GCSE attainment measures for 1999 are available for 409 schools inspected by Ofsted in that year. The assessment of resources among these 409 schools was as follows:

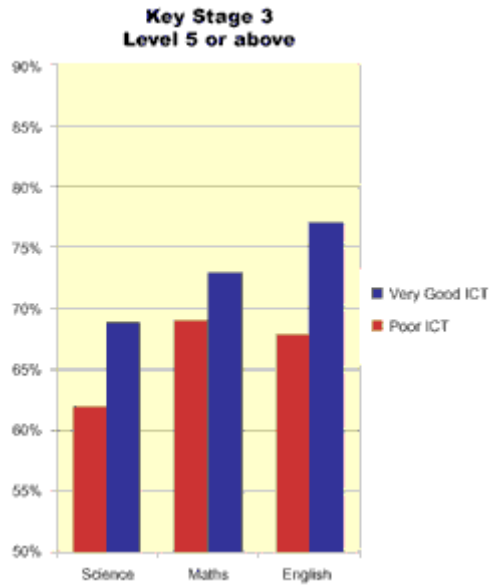
Very good ICT resources	49 schools
Good ICT resources	70 schools
Satisfactory ICT resources	130 schools
Unsatisfactory ICT resources	161 schools
Poor ICT resources	36 schools

In this section, the variation in attainment at Key Stage 3 and GCSE is compared between these groups of schools, defined in terms of ICT resourcing. Attainment is considered for 1999, the year in which Ofsted inspectors made their judgements about the quality of ICT resources.

1.1 Key Stage 3 attainment and ICT resources

Attainment at Key Stage 3 is measured by the proportion of pupils in each school attaining level 5 or above in science, maths and English. The sample is all inspected schools for which Key Stage 3 data is available.

The graph below shows the variation in average attainment between schools with 'Very good' ICT resources (n=49) and schools with 'Poor' ICT resources (n=36).

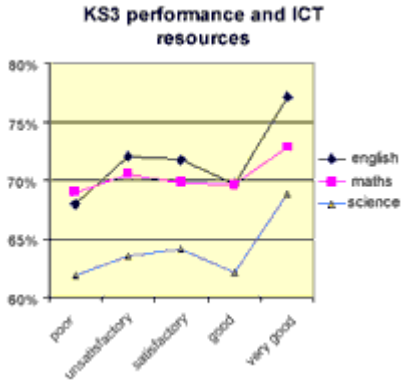


Attainment is higher in all three subjects in schools with 'Very good' ICT resources.

These extremes were chosen because government initiatives on ICT are quickly moving all schools to approximately the same level of resources as the 'Very good' sample.

1.2 Other ICT categories

However, the pattern identified in the last section is not consistent across the range of ICT grades. The graph on the following page shows the proportions achieving Level 5 or above at Key Stage 3 in the three core subjects of science, maths and English. It can be seen that attainment is consistently higher in the top category of schools with 'Very good' ICT resources, and lower in the category with 'Poor' ICT resources.



There is much less discrimination between results in the three middle categories of 'Good', 'Satisfactory' and 'Unsatisfactory' resources.

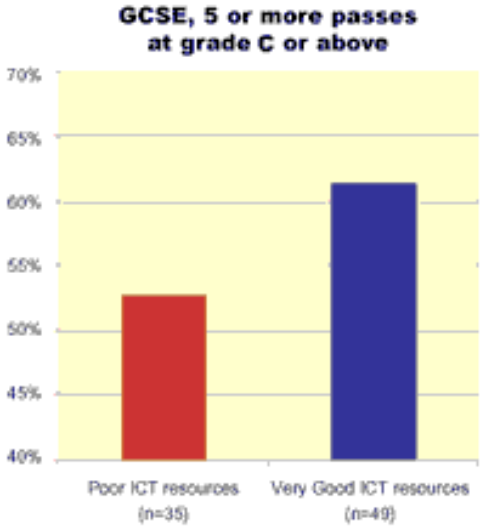
This information is shown using a line graph in order to compare information about three different subjects over the complete range of ICT categories. The use of a line graph is for clarity and is not meant to imply continuous variation. An advantage of this format is that it demonstrates the similarity in patterns of attainment between all three subjects.

It appears that there might be a threshold of ICT resourcing which is associated with improved results, and it may be that until this threshold is reached, the relationship between resources and Key Stage 3 results in maths, science and English is not so pronounced.

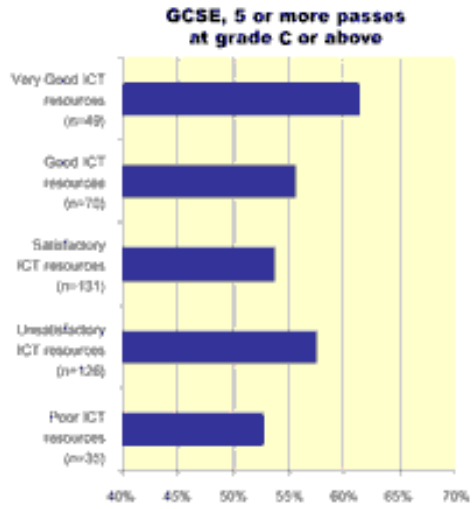
1.3 GCSE attainment and ICT resources

GCSE attainment is tracked using the proportion of pupils in each school who achieved five or more GCSE passes at Grade C or above.

The graph on the below shows the average GCSE attainment amongst schools with 'Very good' and 'Poor' ICT resources. GCSE attainment is higher in schools with 'Very good' ICT resources.



The graph on the below shows that the relationship with GCSE attainment is similar to Key Stage 3 results across the full range of ICT resource grades.



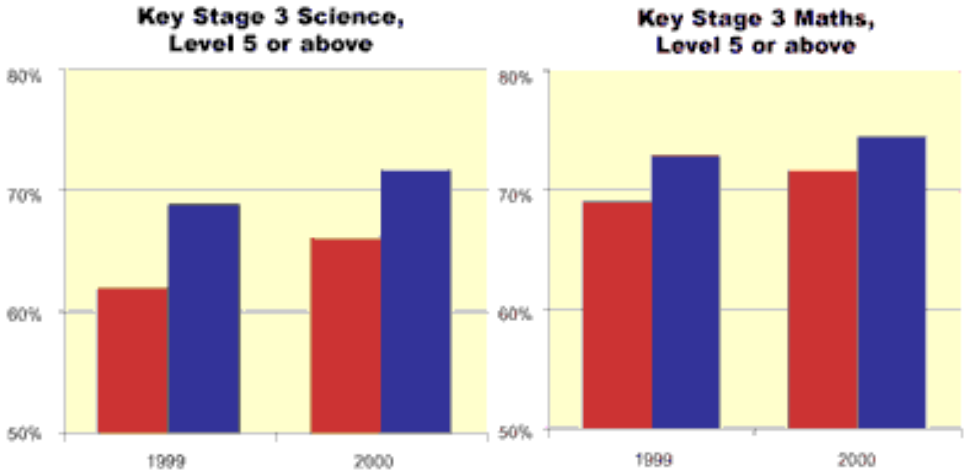
Section 2 - ICT resourcing and sustained attainment

2. Is improvement in attainment sustained over more than one year?

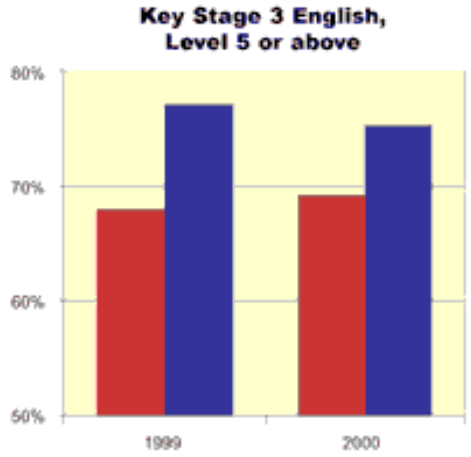
It was found that Key Stage 2 attainment continued to be higher in 2000 tests in those schools which had better ICT resources, compared to those assessed in 1999 as having poor ICT resources. If this improvement is sustained over several years, this is supporting evidence for the suggestion that ICT enhances attainment.

2.1 Key Stage 3 attainment in 1999 and 2000

The following graphs show Key Stage 3 attainment in science, maths and English for 1999 and 2000. In each case, the variation in attainment between schools with 'Very good' ICT resources, and schools with 'Poor' resources is shown.

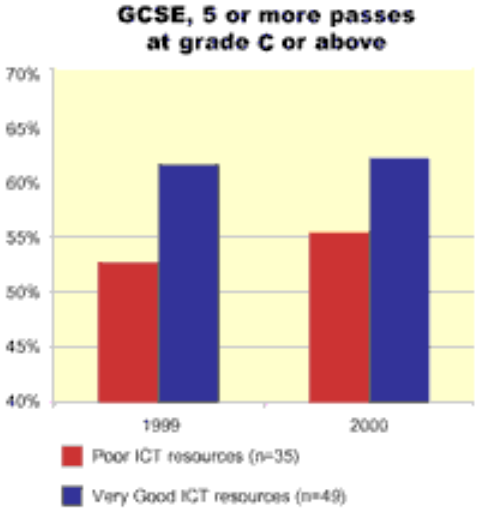


Attainment was higher in schools with 'Very good' ICT resources in 2000 as well as in 1999.



2.2 GCSE attainment in 1999 and 2000

This graph shows the GCSE attainment in 1999 and 2000 for schools with 'Very good' and 'Poor' ICT resources. It can be seen that attainment continues to be higher for schools with 'Very good' ICT resources.



Section 3 - Attainment and school type

3. Is improvement seen in schools of all types?

As the previous sections have shown, attainment is higher in schools with better ICT resources. But is this because these schools have other advantages, which explain their higher attainment?

The strongest predictors of school performance are:

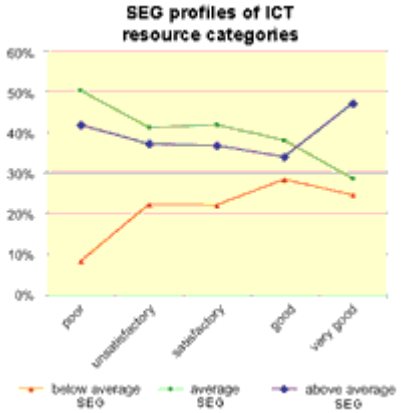
- the socio-economic status of the neighbourhood from which the school pupils are drawn
- the prior levels of attainment which characterise pupils entering the school.

Both of these factors are taken into account in the following analysis.

3.1 Socio-economic grade and ICT resources

Ofsted assigns each school to a socio-economic grade (SEG) based on a postcode analysis of the catchment area of the school. This grade is a very strong predictor of the academic success of a school. Clearly, then, any analysis of the relationship between ICT resources and attainment must consider SEG.

The graph below shows what proportion of schools in each of the ICT resource categories was assigned to above-average, average, or below-average SEG.



It can be seen that the group of schools with 'Poor' ICT resources includes few from below-average SEGs. Of schools with 'Poor' ICT resources, half are in 'average' areas, and 42% in schools of above-average SEG.

A line graph is used for clarity in presenting this data, for the reasons explained in Section 1.2.

In the groups with better ICT resourcing, there are more schools from less privileged areas. Of schools with 'Good' or 'Very good' ICT resources, around one quarter are in a below-average SEG. It may be deduced that funding, for example from Education Action Zones, has served to boost the ICT resourcing of a proportion of less privileged schools.

While it has been shown that a good proportion of schools with poor ICT resources are in privileged areas, other privileged schools have developed good ICT resources. Schools in more privileged neighbourhoods may have better access to informal funding sources (money raised from parental donations, for example), and it appears that many choose to spend a proportion of such funding on ICT development.

Among the schools with better ICT resources, there are fewer 'average' schools. The high-ICT groups include a high proportion of privileged schools, and a high proportion of under-privileged schools, but

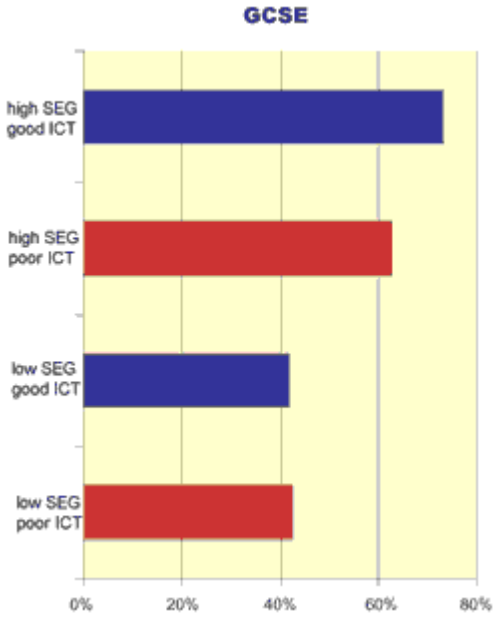
comparatively few 'average' schools. Among average schools, 25% have good or very good ICT resources.

Among privileged schools 30% have good ICT resources. Among schools from low SEGs, 35% have good ICT resources.

Thus, the relationship between ICT resourcing, SEG and attainment is a complex one, and one that we are investigating further.

Attainment, ICT and SEG

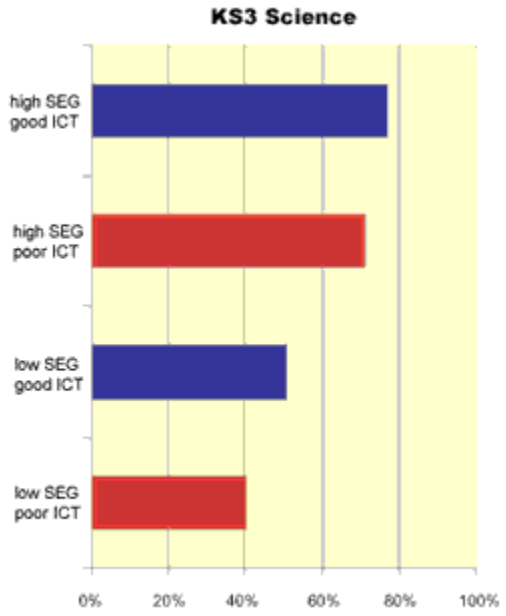
The groups of schools classified as above average (grades B-A*) or below average (D-E*) for SEG were further divided according to the grade given for ICT resources. As we have already seen, there are very few schools of below-average SEG which also have poor ICT resources. This is due to the distribution of resources in schools and the comparatively small number of secondary schools inspected by Ofsted in any given year.

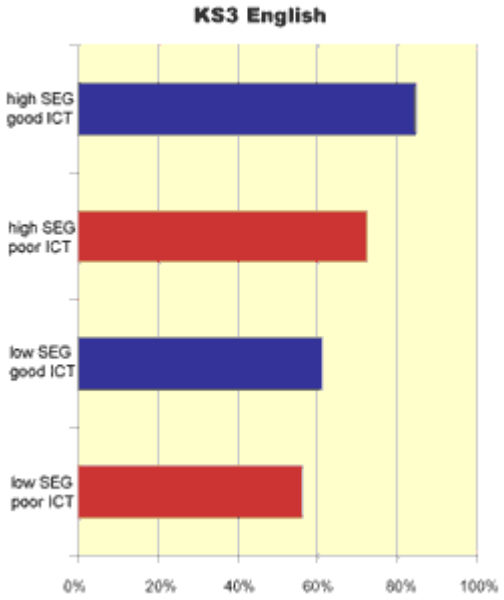


The following graphs show the comparative performance in:

- Key Stage 3 English
- Key Stage 3 maths
- Key Stage 3 science
- GCSE exams

within the four sub-samples of schools defined above.





The following trends can be seen:

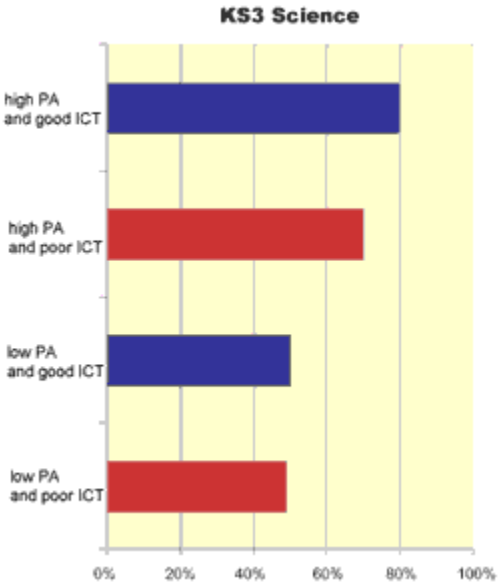
- Schools in the higher socio-economic bands achieve higher pupil attainment at Key Stage 3 and GCSE.
- Schools within the same socio-economic band achieve higher pupil attainment at GCSE and at Key Stage 3 if they have 'Good' ICT resources than if they have 'Poor' ICT resources.

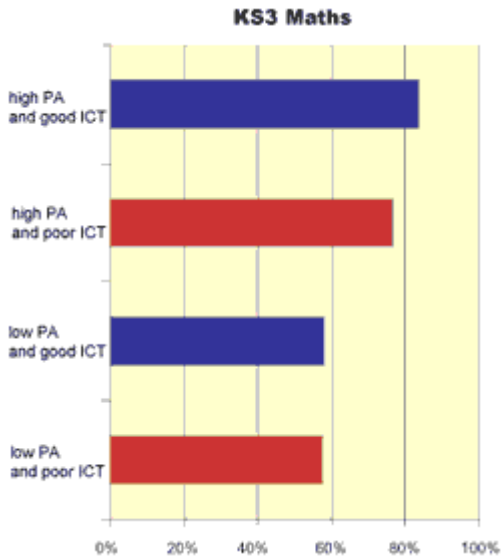
Two samples of schools were selected, based on the prior attainment in national tests of pupils entering the school.

Prior attainment grades A* A, B:	124 schools
Prior attainment grades D, E, E*:	105 schools

From these samples, smaller sub-samples were selected based on the Ofsted grade given for adequacy of ICT resources (good/very good, poor/very poor). The following graphs show the comparative performance in:

- Key Stage 3 English
- Key Stage 3 maths
- Key Stage 3 science
- GCSE exams.





In each case the following trends can be seen:

- Schools with higher prior attainment achieve higher pupil standards than those with lower prior attainment.
- Among schools with high prior attainment, good ICT resources are associated with markedly better pupil attainment at both Key Stage 3 and GCSE.
- Among schools where pupils have low prior attainment levels, there is no difference in attainment associated at GCSE with better ICT resources.

This mirrors a finding established in the primary research, that schools with lowest pupil achievement show less benefit, or less immediate benefit, following an improvement in ICT resourcing.

Section 4 - ICT support for subjects

4. Is attainment in individual subjects higher where ICT is specifically used to support that subject?

If the use of ICT enhances pupil attainment, then attainment should be higher in those subjects that are actively supported by ICT.

4.1 Key Stage 3 attainment in subjects supported by ICT

The DfEE survey of ICT in schools, 2000, asked headteachers to list the subjects in which ICT was used 'substantially'.

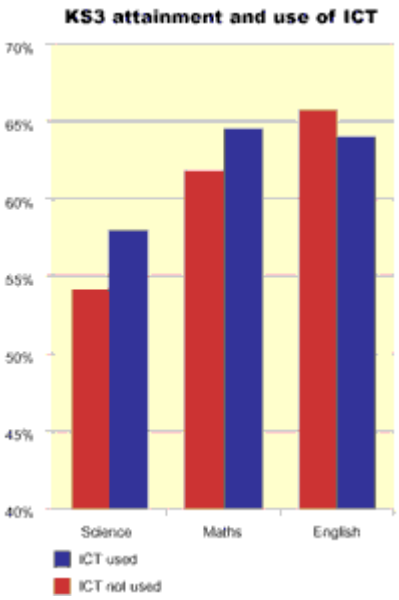
This data was provided by 714 secondary schools:

- 355 claimed substantial use of ICT to support English
- 354 claimed substantial use of ICT to support maths
- 348 claimed substantial use of ICT to support science.

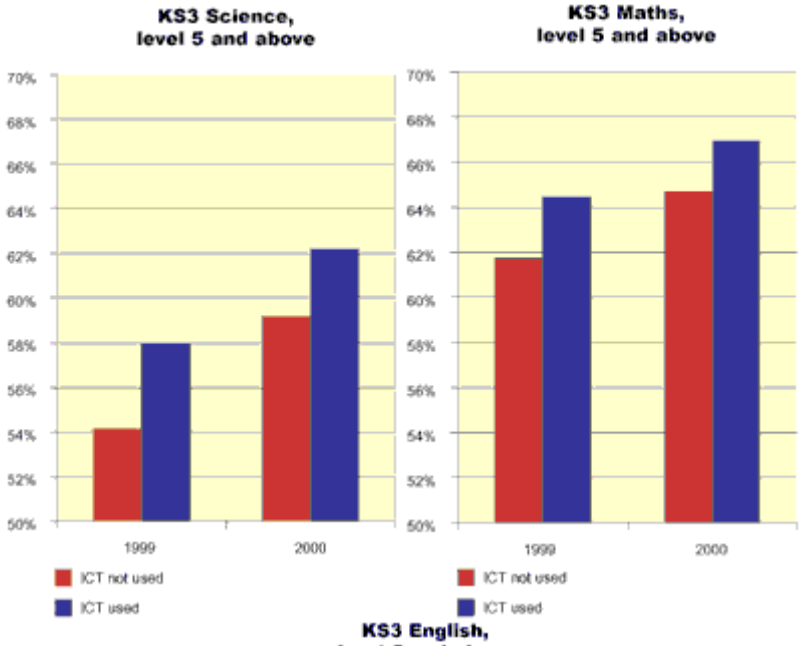
The graph on the right shows the average proportion of pupils attaining Level 5 or above in science, maths and English, among the schools claiming to make substantial use of ICT.

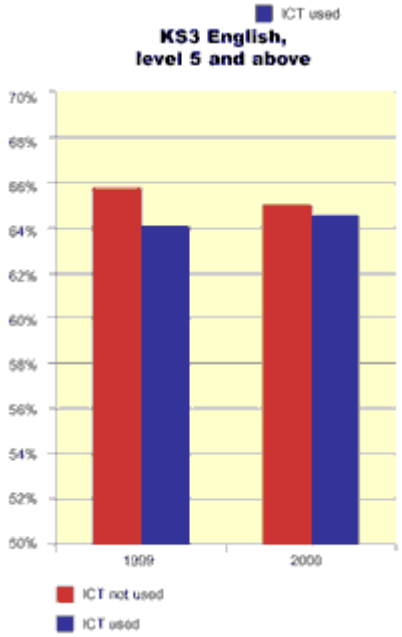
The average for schools that claimed little or no use of ICT in the subject is also shown.

In science and maths, schools that make more use of ICT have higher attainment at Key Stage 3. This pattern is not seen in English.



The next three graphs show the same information, including KS3 attainment for the following year (2000). Once again, attainment in science and maths shows a positive relationship to use of ICT, but English does not follow this pattern.





At first sight, the results for English appear anomalous. However, further analysis sheds light on this pattern.

4.2 Key Stage 3 attainment and use of ICT across the curriculum

Where a headteacher reports that ICT is used substantially within a school to support a subject, there are two possibilities:

- ICT is used to support this subject, but is not widely used across the school
- ICT is used to support this subject, as part of a wide programme of curriculum support by ICT.

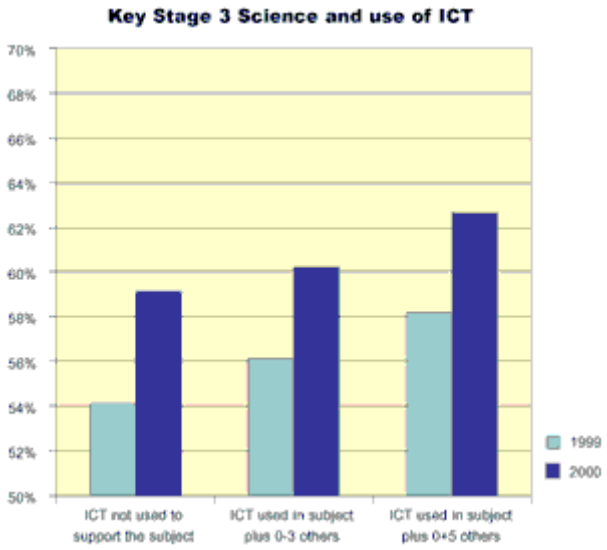
It was found that the pattern of attainment was very different between these two groups of schools.

Attainment in science

Attainment in Key Stage 3 science was compared between the following groups of schools:

- Those where ICT was not used to support science (366 schools)
- Those where ICT was used to support science, and no more than three other subjects (52 schools)
- Those where ICT was used to support science, and five or more other subjects (212 schools).

The next graph shows attainment in 1999 and 200 for these three groups.



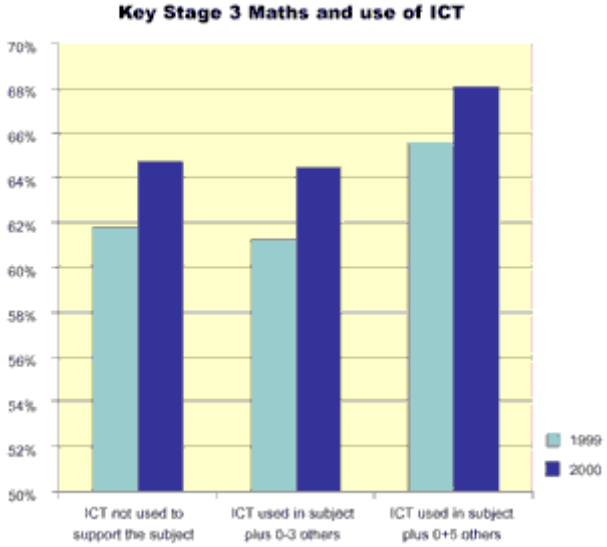
Science attainment improved for all groups between 1999 and 2000. In addition, it can be seen that the impact on attainment is much greater when the use of ICT in science is combined with use in several other curriculum subjects. It may be that the more subjects in which ICT is used, the greater the development of pupils' ICT skills. There is a strong relationship between ICT skills and subject attainment, which is discussed further in section 6.

Attainment in maths

Attainment in maths was similarly compared between three groups of schools:

- Those where ICT was not used to support maths (322 schools)
- Those where ICT was used to support maths, and no more than three other subjects (43 schools)
- Those where ICT was used to support maths, and five or more other subjects (213 schools).

Results are shown in the next graph.



As with science, there was an improvement in Key Stage 3 maths attainment between 1999 and 2000.

The results indicate that the impact of ICT on maths is much greater when ICT is used in a wide range of other subjects. This is a similar result to that seen for science, but more striking. The use of ICT in maths alone, or with few other subjects, is comparable to not using ICT at all. It is only when use of ICT in maths is combined with widespread use across the curriculum that standards are seen to be higher.

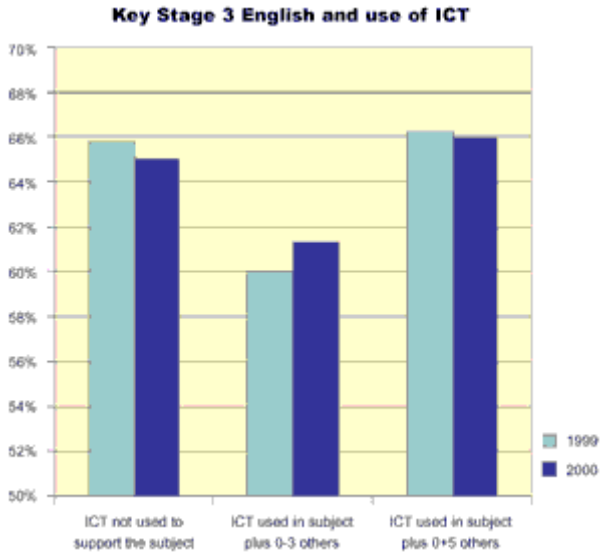
Once again, evidence points to the possibility that there is an ICT 'threshold'. Once ICT is sufficiently widely developed then there is a noticeable relationship with attainment. However, where ICT is still restricted to one subject, there is little evidence of impact.

Attainment in English

Attainment in English was similarly compared between three groups of schools:

- Those where ICT was not used to support English (331 schools)
- Those where ICT was used to support English, and no more than three other subjects (47 schools)
- Those where ICT was used to support English, and five or more other subjects (207 schools).

Results are shown in the next graph.



Compared with maths and science, there was little improvement in English attainment between 1999 and 2000.

The use of ICT to support English lessons does not show the strong relationship to improved standards that was seen in science and maths. However, further subject-level analysis would be required to provide a complete picture.

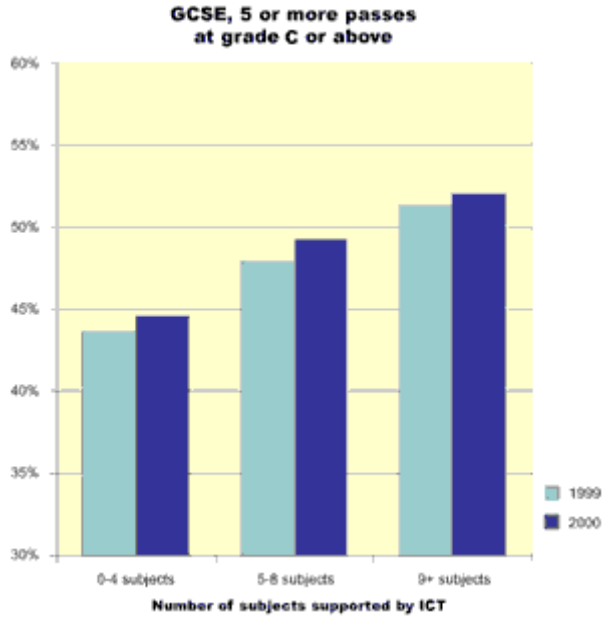
Where ICT use in English is combined with ICT use across many curriculum areas, results are more positive than where ICT is not used at all. Thus it appears that the negative relationship seen between ICT use and English attainment (see above) is caused by the effect of the schools where ICT is used in English and few other subjects. In these schools, English attainment is quite low and this drags down the overall averages. This provides more evidence of a crucial threshold of ICT use and skills, above which a positive impact is seen.

4.3 GCSE attainment and ICT use across the curriculum

The GCSE data used in this analysis does not include information about individual subjects. The proportion of pupils achieving five or more passes at grade C or above (in any subject) is used as an index of attainment.

The following graph shows the proportion of pupils reaching this level of GCSE success in three groups of schools:

- 240 schools mentioning substantial use of ICT in four or fewer subjects
- 300 schools mentioning substantial use of ICT in between five and eight subjects
- 92 schools mentioning substantial use of ICT in nine or more subjects.



In each group of schools GCSE attainment improved slightly between 1999 and 2000. Those schools that used ICT to support more subjects had better GCSE results than those that made narrower use of ICT. This is in line with the results seen at Key Stage 3, where wide use of ICT across the curriculum is associated with higher standards.

Section 5 - Attainment and good use of resources

5. Is attainment highest when good ICT resources are well used within schools?

If ICT is a tool that supports teaching and learning, then attainment will be higher in schools where ICT resources are well used. If there is no relationship, and the association is just coincidence, then it may be expected that the way in which the ICT resources were used would make no difference to overall results.

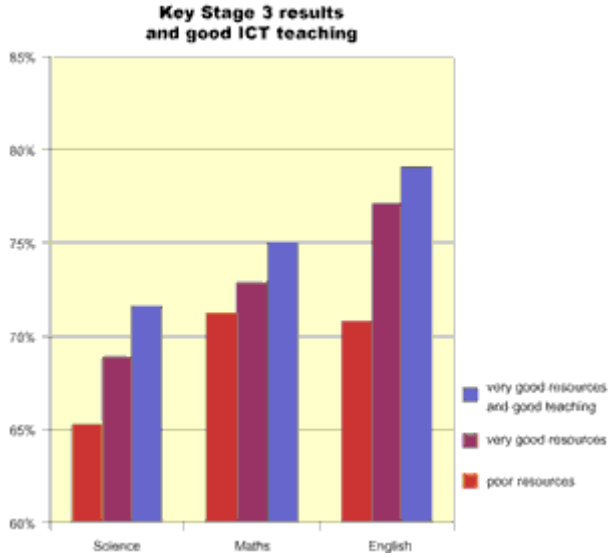
It has already been shown that attainment at Key Stage 3 and at GCSE is higher in schools with very good ICT resources than in schools with poor resources. If the hypothesis is correct, then attainment should be even higher when very good resources are combined with good use.

Ofsted inspectors give grades for the quality of ICT teaching, the ethos for learning in ICT, and use of ICT accommodation and resources. A grade of B, A or A* for these measures is taken to indicate good use of ICT as a learning tool.

5.1 Combining very good resources with good teaching

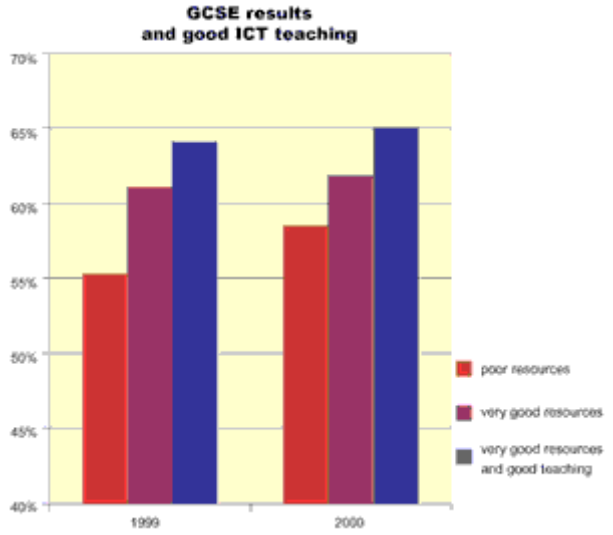
Some 49 secondary schools were assessed as having very good ICT resources. These schools generally achieved above average results at Key Stages 3 and 4. When this group is further restricted to those schools that had good ICT teaching, the results are shown below.

Some 40 schools combined very good ICT resources with good ICT teaching. The next graph shows the Key Stage 3 results for these schools.



Average Key Stage 3 attainment in English, maths and science is higher when very good ICT resources are combined with good ICT teaching.

The next graph shows average GCSE attainment rates, for 1999 and 2000.



GCSE attainment is higher when very good ICT resources are further enhanced by good ICT teaching.

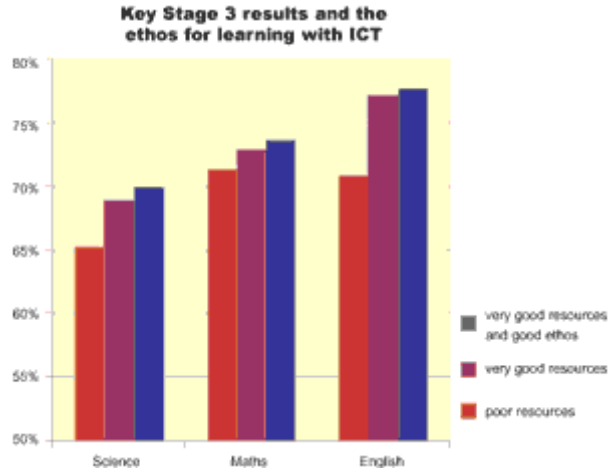
At both Key Stages 3 and 4, schools which combine good ICT resources with good ICT teaching are seen to have higher levels of pupil attainment. These results are preliminary, based on only a sample of secondary schools, but they do support the suggestion that ICT is a tool which can be used to enhance learning, particularly in this case if combined with skilful teaching.

5.2 Combining very good resources with good ethos

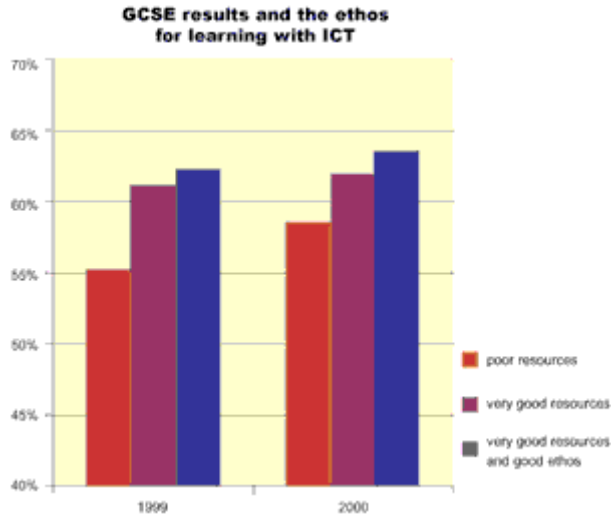
Ofsted inspectors assessed each school's 'ethos for learning' in relation to ICT. A school with a good ethos for learning with ICT will make good use of the ICT resources that are available.

The next graph shows the Key Stage 3 attainment between:

- 43 schools with poor ICT resources
- 49 schools with very good ICT resources
- 42 schools that combine very good ICT resources with a good school ethos for learning with ICT.



Attainment is highest when very good resources are combined with a good ethos for learning with ICT. The next graph shows average GCSE results among the same groups of schools.



Once again, these results are preliminary and indicative, but suggest that ICT is a learning tool which, if well used, will enhance pupils' attainment.

5.3 Combining very good resources with good 'use of resources'

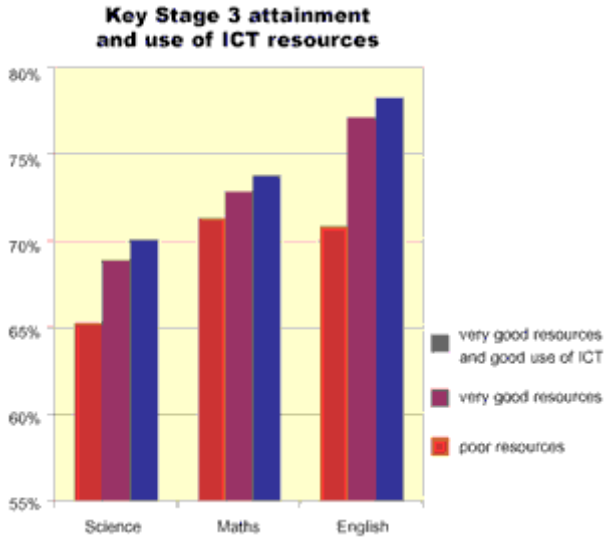
In 1998-99 inspections, a judgement was given for each subject area concerning the 'use of accommodation and resources'. This measure is taken as a third useful indicator of positive use of ICT within a school to enhance learning.

Three groups of schools are shown in the next graph:

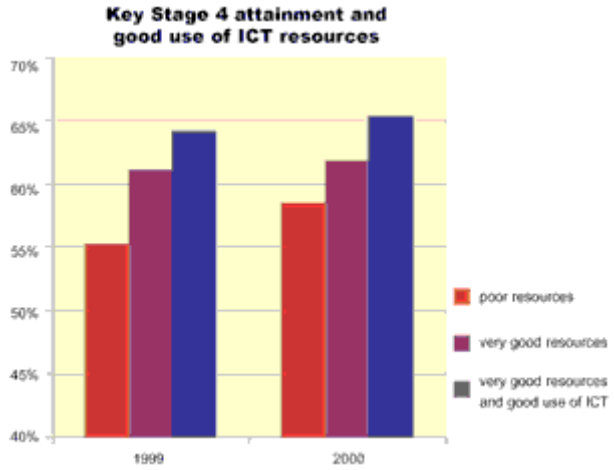
- 43 schools with poor ICT resources
- 49 schools with very good ICT resources

- 39 schools which combine very good ICT resources and a good grade for 'use of resources' in the ICT subject area.

The next graph shows comparative Key Stage 3 attainment rates for these three groups of schools.



The next graph shows GCSE attainment among the same three groups of schools.



These results show that attainment is higher where ICT resources are well used, and imply that when used effectively, ICT is a tool that supports teaching and learning.

Section 6 - Attainment and ICT skills

6. Is the development of ICT skills by pupils related to attainment in other subject areas?

If ICT is a tool that can be used to enhance learning, then attainment should be highest among those pupils who have developed high ICT skills. Secondary pupils have greater capability than primary pupils to work independently, using their own study skills and learning resources inside and outside

the school. A relationship has been observed at primary level between ICT skills and attainment in other subjects, and this analysis investigates this relationship at secondary level.

Two grades provided by Ofsted inspectors are used as indicators of positive development of ICT skills by secondary school pupils. These are:

- attainment against the ICT curriculum
- attitudes and behaviour in ICT lessons.

One problem which arises in assessing the impact of ICT skills development on attainment is that the development of ICT skills may be influenced by several factors, including:

- the overall academic proficiency of pupils, and prior attainment levels
- access to ICT resources at home
- the development of ICT skills due to positive action within the school itself.

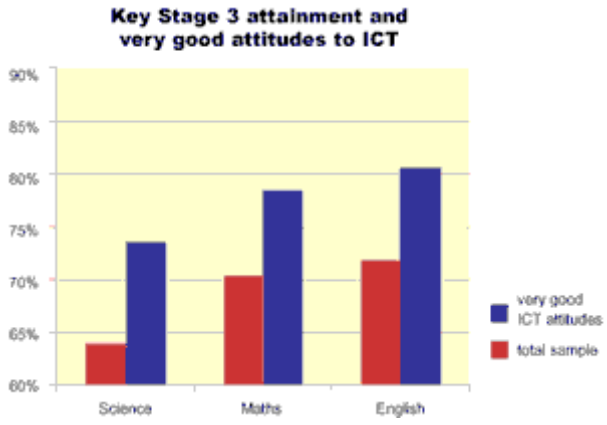
The first two factors are likely to be related to socio-economic grade, which is a positive predictor of higher academic attainment. It is therefore important to determine, firstly, if the development of ICT skill is positively related to attainment in other subjects and, secondly, to demonstrate that this relationship is not merely a question of comparing more and less socially privileged schools.

6.1 Attainment and attitudes to ICT

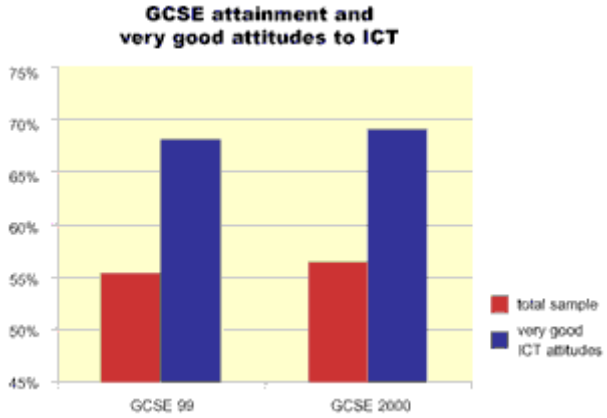
Do pupils who take a positive attitude to ICT achieve higher grades' This comparison is complicated by the fact that attitudes to ICT are generally positive; very few schools were graded as less than 'satisfactory' on this measure. Any sample of schools with 'unsatisfactory' attitudes would be too small to use for a realistic estimation of attainment.

Therefore, the comparison shown in this section is between average attitudes across the entire sample of 418 inspected secondary schools, and attitudes among the 103 schools where attitudes to ICT were 'Very good' or 'Excellent'.

The first graph shows this comparison for Key Stage 3 results in science, maths and English in 1999.



The second graph compares GCSE results in 1999 and 2000 between this sub-sample, and averages for all secondary schools.

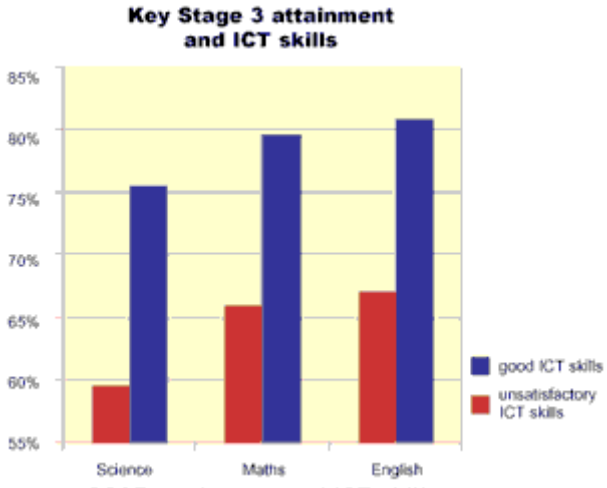


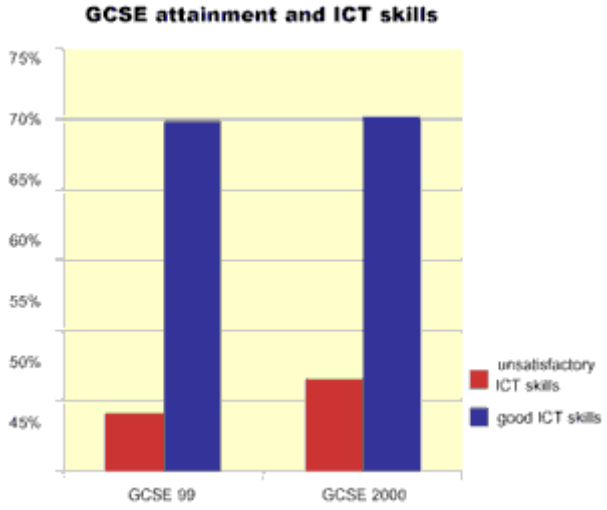
These results support the suggestion that development of a positive attitude to ICT among pupils is associated with general attainment across the curriculum.

6.2 Attainment in ICT and in other curriculum areas

Is the development of ICT skills by pupils associated with high attainment in other areas of the curriculum'

The following graphs compare attainment at Key Stage 3 and at GCSE between the 100 schools where pupil ICT attainment was assessed as 'good' (or better), and the 115 schools where it was assessed as 'unsatisfactory' (or worse).





It can be seen that at both Key Stage 3 and 4 there is a strong positive association between the development of ICT skills and higher attainment in other subjects.

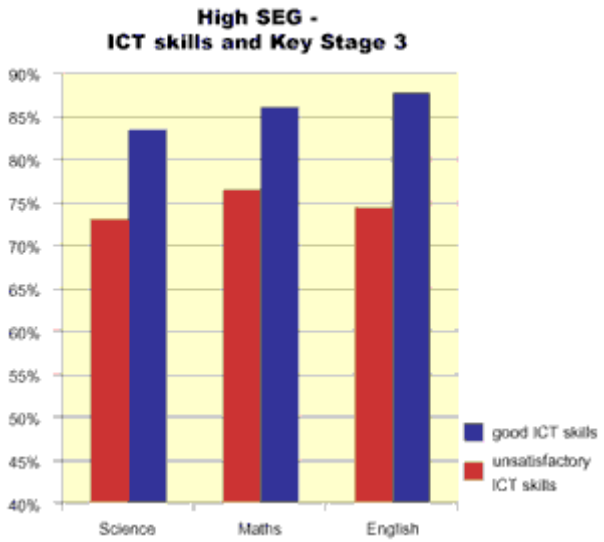
6.3 ICT Skills and Socio-economic background

The development of ICT skills is better, in general, in schools from higher SEGs[1] (socio-economic groups). This can be attributed to two factors: these schools generally show higher attainment in relation to any curriculum area and in particular in relation to ICT, and pupils may have greater access to ICT resources in the home.

It is sensible to compare the relationship between ICT skills and curriculum attainment for schools in the same SEG. If schools of the same social background show better attainment where ICT skills are better developed, this provides stronger evidence.

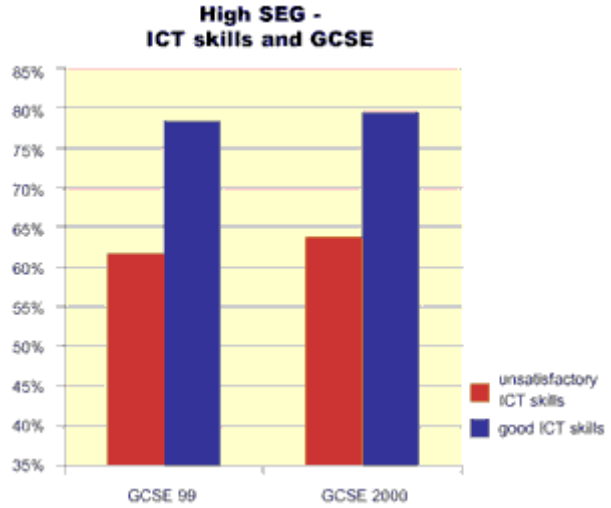
High SEG schools

There were 158 schools altogether in higher-than-average SEGs (graded B, A or A*). Of these schools, 63 were rated as showing 'good' ICT skills and 24 were rated as having 'unsatisfactory' ICT skills. The next graph shows the difference in Key Stage 3 attainment between these two groups of schools.



Key Stage 3 attainment is generally high in all subjects in these more socially privileged schools. However, attainment is even higher among schools where ICT skills are well developed, than among schools where pupils have unsatisfactory ICT skills.

The next graph compares GCSE attainment between these two groups of schools.

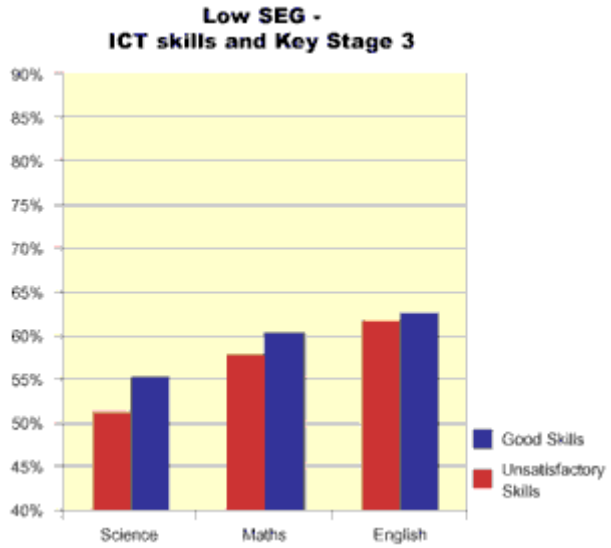


The same pattern is shown. The proportion of pupils achieving five or more GCSEs is generally high among these schools. However, the proportion is noticeably higher among the sub-sample where ICT skills are 'good' than among those where they are 'unsatisfactory'. This analysis indicates that, while attainment is generally high in schools in more privileged areas, it is even higher among schools where pupil attainment in ICT is well developed. This suggests that the high attainment associated with ICT skills is not simply due to social factors.

Low SEG schools

In all, Ofsted categorised 93 of the schools inspected in 1998-99 as 'below average' in terms of SEG (grades, D, E and E*). Of these schools, 38 were characterised by 'unsatisfactory' ICT skills and only 8 by 'good' ICT skills. In the two following graphs the small sample size, particularly among the 'good ICT skills' group, must be borne in mind.

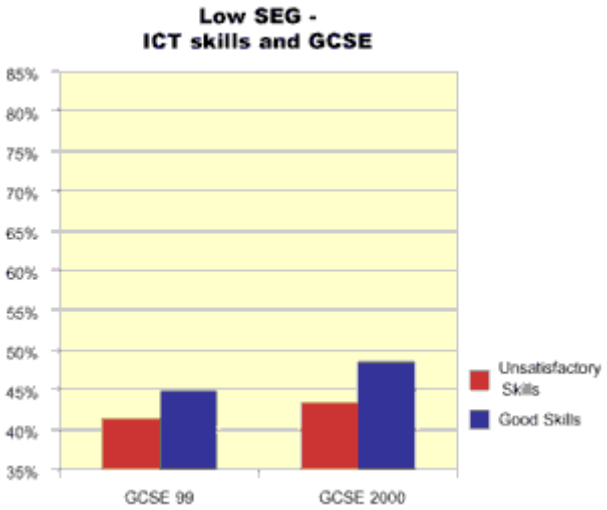
The first graph compares Key Stage 3 attainment for 1999 between these two groups of schools. The same scale is used as for the 'High SEG' graph above.



It can be seen that Key Stage 3 attainment is generally lower among schools in lower SEGs. Attainment is higher among the schools where ICT skills are better. This is the same pattern as was seen for the high SEG schools. The precise importance of the differential between the high and low ICT groups is difficult to determine because of the small sample size. However, a similar differential between the two groups was also seen in 2000 as the next table shows.

Low SEG and ...		
	Good skills	**Unsatisfactory skills**
English 2000	65%	62%
Maths 2000	63%	61%
Science 2000	61%	55%

The next chart shows GCSE results in 1999 and 2000 for the two groups of low-SEG schools. The scale used is the same as for the graph of GCSE results among high-SEG schools.



A similar pattern can be seen as for Key Stage 3. Attainment is lower among this group of schools in general, but levels are higher among schools where ICT skills are better developed.

Once again, the sample sizes are low, but the pattern is consistent between the two years.

Footnotes to BECTA

i : Of schools in above average SEG, 40% were assessed as 'good' or better for ICT attainment; among schools in below average SEG, this proportion was only 9%.

Section 7 - The school of the future

The 'school of the future' is a phrase indicating those schools which exemplify good ICT resources, and consistently good use of those resources to support learning.

For secondary schools, we have defined the 'schools of the future' as those schools that were rated as 'good', 'very good' or 'excellent' for all of the following features:

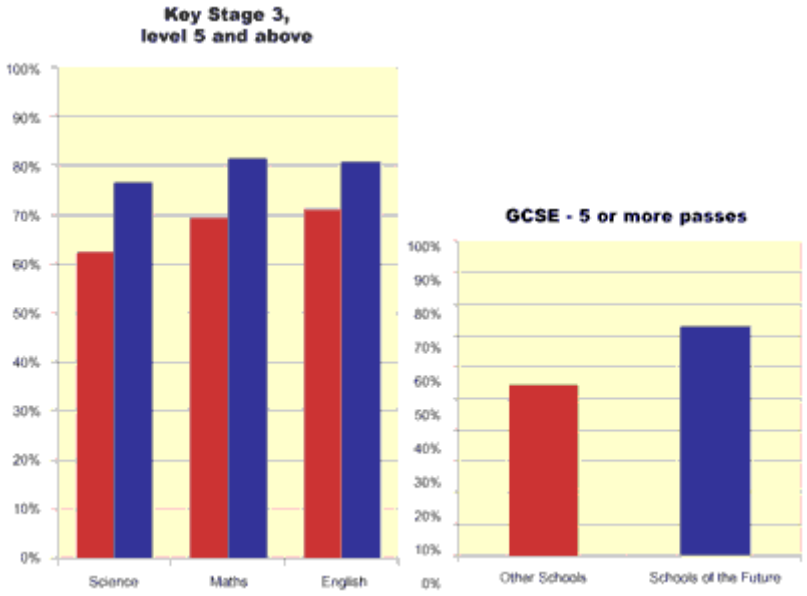
- Adequacy of ICT resources
- Ethos for learning with ICT
- Pupils' attitudes to ICT
- Quality of ICT teaching
- Attainment of ICT skills by pupils

Using these criteria there were 41 secondary schools inspected by Ofsted in 1998-9 which could be classed as 'schools of the future', which is roughly 10% of the total. Of course, there are many other schools which may have similar positive characteristics but were not inspected in that year or which

have acquired these characteristics in the intervening time. These 41 schools therefore provide a useful early sample exemplifying the features which government policy is seeking to develop more widely in schools.

7.1 Attainment in the school of the future

The following graphs show the attainment in Key Stage 3 and in GCSEs for the schools of the future sample, contrasted with the attainment levels of other inspected schools.

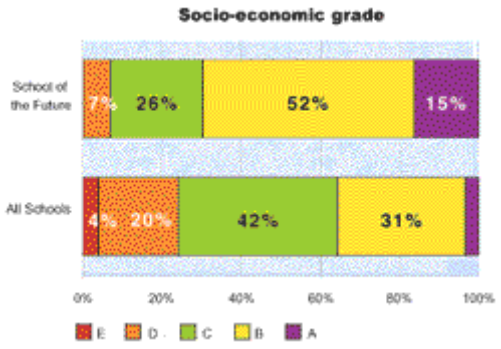


These schools are already reaching Government targets for 2004 in Key Stage 3 English and maths, with more than 80% of pupils reaching level 5 or above. In all three Key Stage 3 subjects, and at GCSE, the 'schools of the future' achieve higher levels of pupil attainment than other schools. This is in line with similar findings for primary schools.

7.2 Social context of schools of the future

Among primary schools, the schools of the future were found in the same range of social circumstances as other schools.

The graph below shows the socio-economic grades given to secondary schools of the future, and the grades given to other schools.



It can be seen that the secondary schools that have been identified as exemplifying the most positive ICT features are drawn predominantly from more prosperous and advantaged areas. Two-thirds (69%) of these schools were in socio-economic grades A or B, compared to one-third (35%) of other schools.

This suggests that there were in 1999 signs of a 'digital divide' between secondary schools that were comparatively better off in socio-economic terms, had good ICT resources, and were using them well, as opposed to worse-off schools. This divide was not just related to ICT resource levels but also to overall pupil ICT skills, and how the schools used their ICT.