# Primary Schools – ICT and Standards

**A report to the DfES on Becta's analysis of**

**national data from OFSTED and QCA**

# Contents

# Becta Report: Primary Schools - ICT and Standards

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## An opening word from Owen Lynch

This publication reports on Becta's analysis of national data on ICT and educational standards. This is the second year that Becta has carried out this analysis. Becta obtained the data from a variety of sources, and I would like to thank OFSTED's Research Division, Analytical Services at the DfES, and QCA for their help in providing this data, and offering valuable advice on the report. Furthermore, I would like to thank Professor David Reynolds, who 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.

The report analyses data from primary schools inspected in the year 2000, and focuses on their Key Stage 2 results and their use of ICT. The first part of the report repeats and verifies the results found in the previous year's report. This provides strong evidence that the results in the first analysis were not statistical coincidences. This year's research has also explored new areas for analysis. In particular, it shows that good ICT learning is dependent on five critical factors: good school leadership, a good general standard of teaching, good management of ICT as a subject, good classroom teaching of ICT, and the availability of good ICT resources. Clearly, the effective use of ICT requires much more than merely providing the right technical infrastructure. For ICT to have a positive effect in schools, it requires significant organisational leadership and good quality teaching across the school.

This report represents a growing evidence base that shows that, where school leaders have developed and deployed ICT strategically, then teachers and learners are using it effectively to transform the teaching and learning processes and raise educational standards.

**Owen Lynch, Chief Executive, Becta**

## Foreword

The last decade has seen significant investment in the provision of ICT hardware and software in schools, with no doubt considerable further investment to come. The ratio of children to each computer, and the connectivity rate for schools, all show significant improvement over time.

However, in many schools and in the mindsets of many teachers there is still a degree of unease about ICT. Whilst surveys show that teacher confidence in use of ICT has risen, the same surveys show a substantial majority of teachers doubting whether ICT has substantially raised educational standards, and the same majority reporting that they only use ICT to a limited degree.

With the benefit of hindsight, it is clear that what explains the paradox of greatly increased provision combined with less than necessary utilisation is probably our inability to provide clear guidelines about how to use ICT - an inability to provide a technology for use of the technology itself. Basic questions about what particular mix of hardware and software applications potentiates what particular skill in what particular topic of what particular subject have not been answered. Knowledge for teachers about 'what works' has been lacking.

This report from Becta, which covers the second year of analysis of national datasets, is therefore timely and welcome. Usefully, it confirms a great deal of the findings from the first year of analysis, so that we can be increasingly sure that ICT really has the positive effects that many of us have hoped for and so that we can be sure of the factors that are associated with getting high-quality ICT in place. This report displays the same careful and cautious science that marked out its predecessor.

It is important to note, though, that this report, however useful it may be, is only a beginning contribution to creating the evidence base that we need. If ICT is to fulfil its potential to transform classrooms and raise standards, we need a national programme of high-quality research that builds upon our existing knowledge and extends it, to make clear 'what works' in the provision of ICT, and to make clear how we can create 'what works' in our schools. Such a programme will be costly, difficult to enable, and will take time to generate definitive findings. However, there has never been a time, since the arrival of ICT in schools 20 years ago, that major research has been more necessary than it is now. Becta hopes very much to play its part in enabling this major research programme to be designed, commissioned and enabled.

**Professor David Reynolds**
**Chair**
**Evidence Committee**
**Becta**

## The research series

This report, and others in the series, may be downloaded in electronic form from the Becta website:

- A Preliminary Report for the DfEE on the Relationship Between ICT and Primary School Standards
- Primary schools of the future - achieving today
- The Secondary School of the Future

Other reports on ICT and education are available from Becta in printed form. Becta's address and contact details can be found on the Contact Becta page.

## Introduction

This report examines the relationship between the use of ICT and educational standards based on data obtained on schools from OFSTED inspections in the year 2000. The report provides an analysis of OFSTED and QCA data for schools inspected in the period January to July 2000.

The analysis is similar to that described in the previous Becta report 'Primary Schools of the Future - Achieving Today', published in January 2001, which reported on schools inspected in the years 1998/99. Its main conclusions were:

- Schools with good ICT resources tended to have better achievement than schools with unsatisfactory ICT.
- When schools in similar socio-economic circumstances were compared, schools with good ICT resources still tended to have better achievement than schools with unsatisfactory ICT.
- When schools with similar quality of management were compared, those with good ICT resources still tended to have better achievement than schools with unsatisfactory ICT.
- Schools where ICT is used within a subject tended to get better results in that subject.
- Schools where good ICT resources were combined with good usage of ICT tended to gain better Key Stage 2 results than those where good ICT resources were not well used.

This year's report considers the question: Are these conclusions substantiated by the new data analysis?

It also considers three further questions:

- What factors are needed for schools to develop good ICT learning opportunities for pupils?
- What effect do the socio-economic circumstances of the school have on these relationships?
- How does ICT usage relate to other outcomes, such as pupils' motivation and attendance, and pupil and parental attitudes?

Like the previous year's report, this analysis considers data at the 'whole school' level. Judgements about teaching and learning made by OFSTED are about the school as a whole, not individual teachers and learners. The analysis looks only at the statistical relationships between different factors within the data obtained from OFSTED inspections and QCA test and examination results. Where there is a subjective interpretation, this is clearly labelled in the text as such.

OFSTED changed its inspection framework in January 2000. These changes are described in Appendix 1, with an explanation of how they affected the analysis. Although the new framework reduced the number of schools given a full inspection, it also asked inspectors to provide new judgements in subject use of ICT. This has enabled this analysis to look in more detail at the relationships between ICT, leadership, teaching and learning. A brief description of statistical methods, the size and the characteristics of the sample is also included in the Appendix.

## Executive Summary

- Section 1 - The relationship between ICT and standards
- Section 2 - Schools' readiness for ICT
- Section 3 - ICT and subjects
- Section 4 - Socio-economic factors
- Section 5 - Other positive outcomes
- Section 6 - The variation between schools

### Section 1 - The relationship between ICT and standards

The relationships between ICT and standards found for schools inspected in 1998/99 were confirmed for the schools inspected in 2000.

Schools judged by OFSTED to have very good ICT resources achieved better results than schools with poor ICT. The difference between the two groups of schools has increased in comparison with the results for the previous year. The very good ICT schools had improved their performance and the poor ICT schools had got worse overall. This difference was also seen for schools in similar socio-economic circumstances. When schools with similar socio-economic backgrounds were compared, those with good ICT resources tended to achieve better results than those with unsatisfactory ICT.

When schools with similar quality of leadership were compared, those with good ICT resources tended to achieve better results than schools with unsatisfactory ICT. However, this relationship was not seen in schools with unsatisfactory leadership.

Schools that made good use of ICT within a subject tended to get better results in that subject than other schools. Schools that combined good ICT resources with good ICT teaching gained better results than those who had good ICT resources but poor ICT teaching.

New OFSTED inspection judgements, available for the first time for that year, also provide further evidence that the relationship between ICT and standards grew stronger if the ICT was strategically deployed and used for developing learning opportunities.

The analysis reported previously, on schools' ICT resources and educational standards, has been verified with a new sample of 1,252 schools inspected in the following year. This is strong evidence that the results in the first analysis were not statistical coincidences. As well as confirming last year's analysis, the data was used to consider issues relating to ICT development in schools. The sections following report on this.

### Section 2 - Schools' readiness for ICT

This section identifies five factors that are essential to the development of good ICT learning opportunities in schools. These were identified from a list of seven school and ICT factors that had the highest correlation to learning standards overall and together represented a context for the learning process. The five critical factors identified were ICT resources, ICT teaching, ICT leadership, general teaching and general school leadership. Two other variables which were examined were not found to be critical - these were the socio-economic circumstances of the school and the prior performance of pupils. The analysis showed that all five factors needed to be present in schools to ensure good ICT learning opportunities.

Schools judged by OFSTED to have good teaching generally had teachers who had a good understanding of ICT, but those given lower grades for teaching did not. Schools with good teaching and good ICT resources generally got better results than schools with good teaching and poor ICT.

Schools with good or very good leadership were nearly twice as likely to have good ICT resources as those with poor or unsatisfactory leadership. Schools with good leadership and good ICT had better results than schools with good leadership and poor ICT.

An analysis of the schools and the five factors showed that 13% of primary schools had all five in place. Schools with at least one good ICT factor usually had good general leadership and good general teaching. Schools with good ICT teaching usually had good ICT leadership. Schools with good ICT resources usually had all other factors in place. This points to a conclusion that ICT is generally being implemented in a developmental way and suggests that ICT resources are not being wasted in schools unable to take advantage of them. There are also significant numbers of schools that have good ICT leadership and teaching, and which are ready to increase the quality of their ICT resources. However, an important issue to consider is how schools with none or only a few factors in place can be better supported with more accessible ICT to achieve success.

**Section 3 - ICT and subjects**

Schools that provide good learning opportunities for ICT as a subject also make good use of ICT for English, mathematics and science teaching. It is likely that, for primary schools where the same teacher generally teaches ICT, English, mathematics and science to the same pupils, teaching ICT capability is closely connected to the use of ICT in other subjects.

Schools that made good use of ICT in a subject generally had good overall subject teaching. Good use of ICT in a subject is not essential for good subject teaching, but it makes it more likely.

Schools with good use of ICT in English, mathematics and science are more likely to be above national standards in that subject than schools with unsatisfactory use of ICT. The good use of ICT in any subject was associated with improvements in all core subjects. The more subjects ICT was used well in, the better the results across all subjects. There is a marked and consistent rise in the average standards for all subjects as the number of subjects with good use of ICT increases from none to all three (English, mathematics, science).

**Section 4 - Socio-economic factors**

The same proportion of schools is found to have good ICT resources across all socio-economic circumstances. The tendency for schools with good ICT learning opportunities to have better standards than those with worse ICT learning opportunities was true for all socio-economic circumstances. For schools in less privileged socio-economic circumstances, the trend is as positive, if not more so, than for more privileged schools. Pupils' ICT attainment was generally independent of socio-economic circumstances. Many schools in less privileged areas were able to make good use of ICT, and those that did had better standards than those who did not make good use of their ICT.

**Section 5 - Other positive outcomes**

Schools with very good ICT resources were generally judged to have better pupil attitudes and pupil behaviour than schools with poor or unsatisfactory ICT resources. This relationship was stronger if ICT learning opportunities were considered.

Schools with very good ICT resources were generally judged to have better parental attitudes to the school than those with poor or unsatisfactory ICT resources. This relationship was again stronger if ICT learning opportunities were considered.

These findings suggest an association between good use of ICT in schools and the motivation of pupils and parents, although it could be interpreted in two ways - good ICT could help develop good school ethos and home links, or schools with good ethos and home links could develop good ICT.

There was a strong relationship between pupils' attainment, effort and independence in ICT and the quality of the ICT resourcing and its deployment, and teachers' understanding of ICT. This is relatively independent of socio-economic factors. Whilst the home environment may be effective in developing some ICT skills, the ICT environment of the school is important in developing ICT capability in the wider national curriculum context.

**Section 6 - The variation between schools**

The variation seen between schools in relation to ICT variables was large, and greater than for many general school factors. ICT resources varied between schools. There was considerable variation in key stage attainment between individual schools in each band but this was least when ICT learning opportunities were very good.

Comparing the range of values given by OFSTED for general school leadership to those for ICT leadership; the average level of school leadership was generally higher than that for ICT leadership. Comparing general teaching grades to ICT teaching grades, again the ICT grades were generally lower, with over one third poor or unsatisfactory. While the overall analysis points to a positive relationship between ICT factors and standards, the differences between schools are large, which may reflect the variation in the quality of the use of the ICT as well as other factors. There is clearly a need to improve the quality of ICT leadership, ICT teaching and ICT use in the classroom in order to reduce these wide differences.

# Section 1 - The relationship between ICT and standards

## ICT and standards

Last year's report began by comparing the average English, mathematics and science Key Stage 2 (KS2) results between schools with very good ICT resources and those with poor ICT resources. Figure 1.1 shows results for the 1,252 primary schools which had a full inspection in the spring and summer terms of 2000. The quality of ICT resources was determined from judgements made through OFSTED inspections and the KS2 results for each school were obtained from national data collected by QCA. The size of the bar gives the average English, mathematics and science results at Key Stage 2 for these schools. This shows that schools with very good ICT resources outperform those with poor ICT.

Fig. 1.1

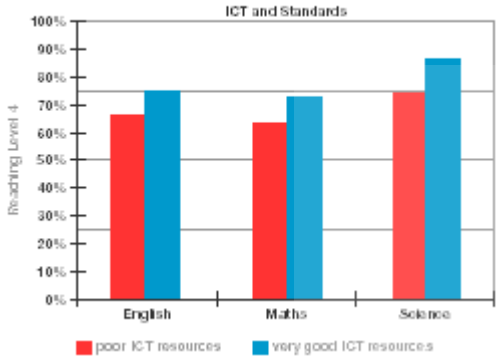



Table 1.1 gives the precise percentages and compares results for schools inspected in 2000 with results of schools inspected in the previous year. Schools with very good ICT resources tend to achieve better test results than schools with poor ICT resources. The difference between the two groups of schools has increased in comparison with the results of the previous year. There have been changes to the sample of schools given a full OFSTED inspection. These are considered in the Appendices. Despite these changes, the differences are still positive and significant.



**Table 1.1 Results for 2000 compared with 1998/99**

| Results | Poor ICT | Very good ICT resources | Difference |
|---|---|---|---|
| **English** | 66% (68%) | 75% (71%) | +9% (+3%) |
| **Maths** | 63% (67%) | 72% (71%) | +9% (+4%) |
| **Science** | 74% (76%) | 86% (80%) | +12% (+4%) |

(Figures for 1998/99 are shown in brackets - the populations are not exactly comparable, because of the effect of short inspection. However, when the results are weighted to compensate for this, there was no major effect on the results, as reported in Appendix 1.)

## The relationship between ICT and standards over two years

The three graphs in Figure 1.2 show the results for schools inspected in 2000. These show average results from their 1999 and 2000 Key Stage 2 tests. Results are again compared between schools with poor ICT resources, and schools with very good ICT resources.

Both groups of schools have a general rise in standards between 1999 and 2000, reflecting a national picture of improving standards. However, the difference between the two groups of schools also widens between 1999 and 2000.

Fig.1.2a

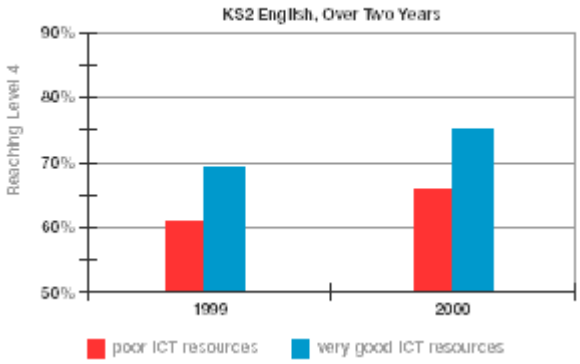



Fig.1.2b

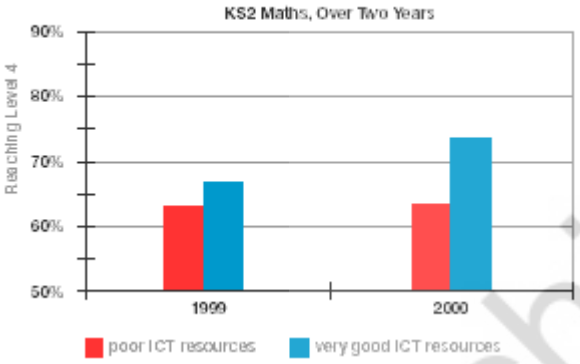
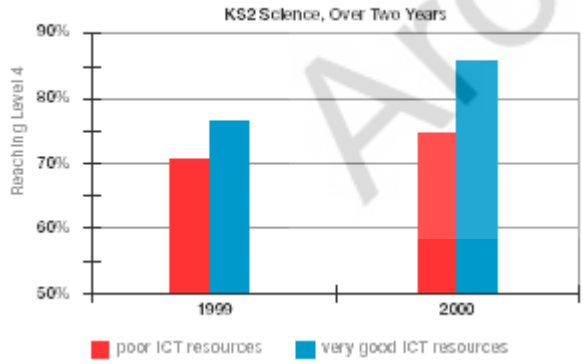



Fig.1.2c






## Good and very good ICT resources

The comparison used so far in this report has been between the two extremes - the schools with very good (OFSTED grade A) and poor (OFSTED grade E) ICT resources. The difference in resources between these two groups of schools is marked, and the difference in key stage results is significant.

These are important sets of schools for consideration in this report. The expectation is that more schools will reach the category of very good ICT over the next two years and that no schools will by then have poor ICT resources.

**Table 1.2**

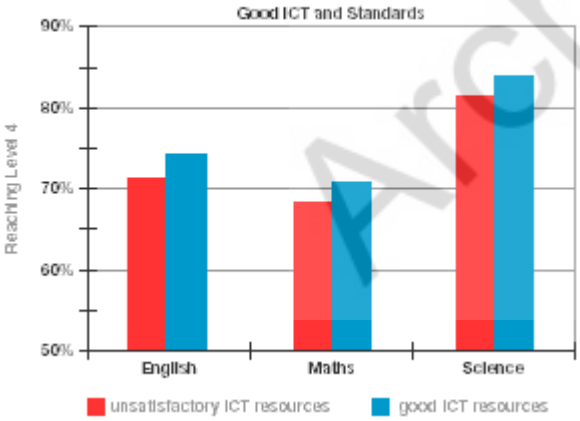
| | Size of sub-sample |
|---|---|
| **Very good ICT resources (grade A)** | 106 schools |
| **Good or very good ICT resources (grades A and B)** | 422 schools |
| **Poor ICT resources (grade E)** | 54 schools |
| **Poor or unsatisfactory ICT resources (grades D and E)** | 324 schools |

However, as seen in Table 1.2, these samples are quite small in size, and this makes it difficult to carry out further statistical analysis (for example, further dividing the sample by social grade or management quality) without reducing the statistical confidence of the results.

It is possible to expand sub-sample size by including schools with good (grade B) and unsatisfactory (grade D) resources. The table shows the increased sample size which can be obtained in this way. However, the increase in sample size means a reduction in the difference between the best and worst ICT sub-samples in their Key Stage 2 results.

Figure 1.3 shows that there is still a noticeable difference between the two more broadly defined groups. In this figure 'good' means good or better, 'unsatisfactory' means unsatisfactory or worse.

Fig. 1.3




## Is the socio-economic grade of the school a factor?

Last year's report examined a number of factors that could provide an explanation for this difference in the performance of schools with very good and poor ICT. Clearly, one simple explanation for this difference in standards would be if schools in better socio-economic circumstances tended to have better ICT resources. Last year's report investigated this secondary relationship by looking to see if there was a relationship between ICT resources and standards among schools in the same socio-economic category. The following sequence of graphs repeats this analysis for schools inspected in 2000.

Fig. 1.4a

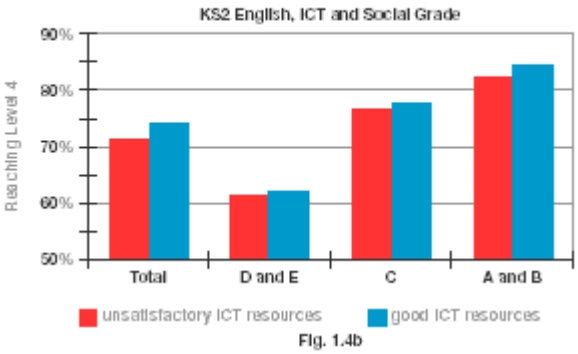



Fig. 1.4b

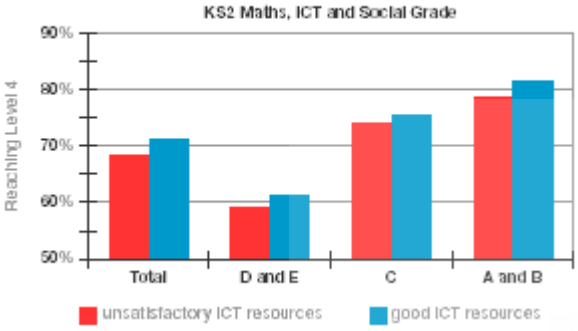
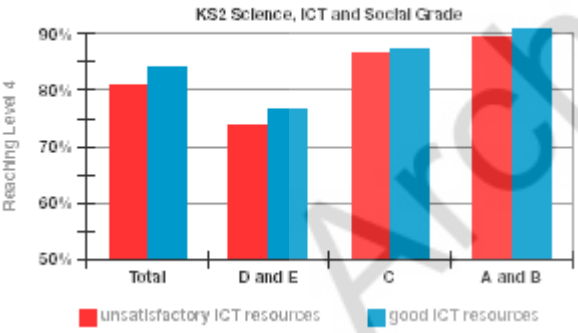



Fig. 1.4c






The graphs in Figure 1.4 show that there is a difference between schools with good ICT resources and unsatisfactory ICT resources, for the total sample, and for schools within each socio-economic band (D and E - the most disadvantaged, C - average, and A and B - the most advantaged). It is clear that there are major differences in the overall standards for each social group but, when schools in similar circumstances are compared, schools with good ICT resources still tend to have better achievement than schools with unsatisfactory ICT resources.

The issue of socio-economic differences is explored further in Section 4.

### Is the quality of leadership a factor?

In a similar manner, the relationship between the quality of leadership and ICT can be investigated. The three graphs in Figure 1.5 show Key Stage 2 (KS2) results among sub-samples defined by quality of leadership. The graphs firstly show that schools with better leadership, as judged by OFSTED, tend to get better results in KS2 tests.

Fig. 1.5a

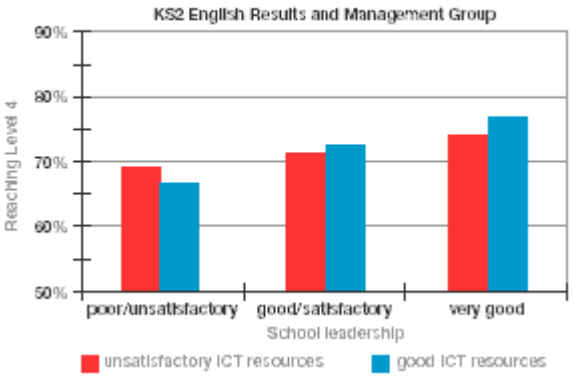



Fig. 1.5b

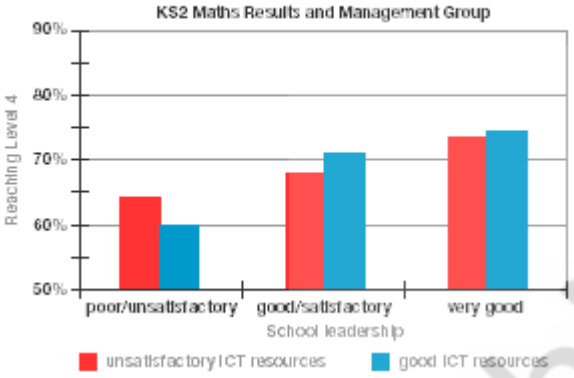
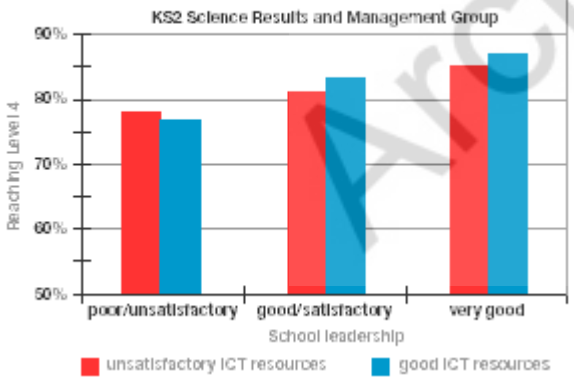



Fig. 1.5c






The graphs also show that, in schools where leadership is very good, good or satisfactory, better ICT resources are associated with better results. But, for schools with poor leadership, there is no such association. In fact, for these schools the relationship between results and ICT resources is a negative one. This is a different result from that revealed in last year's analysis. This area is further investigated in Section 2.

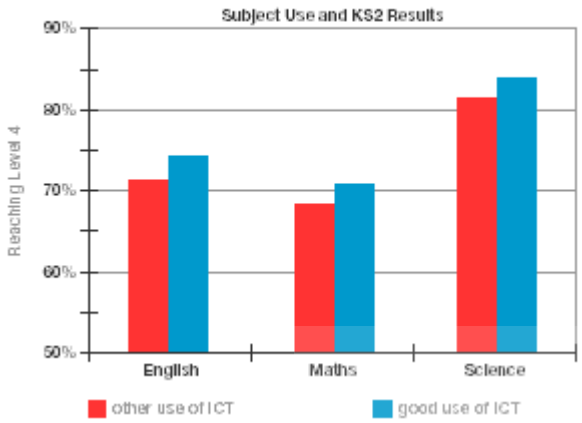
### Is subject use a factor?

As well as providing whole-school ICT resource data, OFSTED inspections include judgements on the quality of use of new technologies in each subject. Figure 1.6 shows the average results for those schools which are judged to make good use of ICT in a subject compared to those which do not.

Schools which make good use of ICT within a subject tend to get better results in that subject than those which do not.

This relationship is further analysed in Section 3.

Fig. 1.6

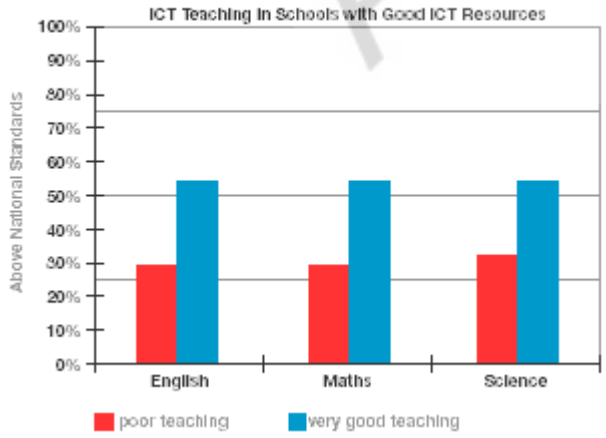



## ICT, standards and ICT teaching

Last year's analysis showed that schools with good ICT resources and good ICT teaching did significantly better than schools with good ICT resources but poor ICT teaching. Figure 1.7 shows results for schools inspected in the year 2000. In these graphs, the length of the bars shows the percentage of the sample getting above the national standard for that subject, as measured by the percentage of pupils reaching level 4 in that subject.

While schools with good ICT do not automatically get good results, those with a combination of good resources and good teaching do.

Fig. 1.7

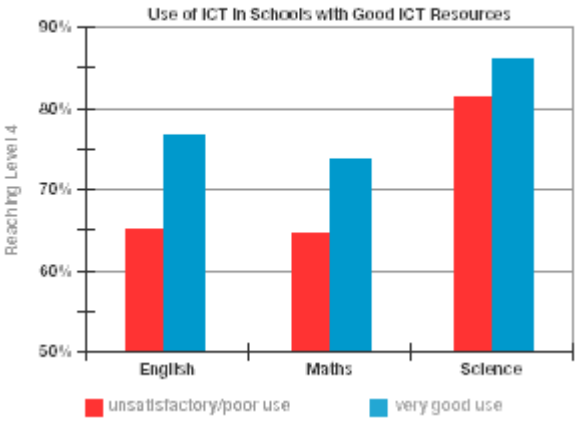



## ICT, standards and use of ICT

OFSTED also judges the use of ICT. Figure 1.8 shows Key Stage 2 results for schools with good ICT resources. Average pass rates are compared between schools judged to make 'very good use of new technology' to support the ICT curriculum, and those judged to make unsatisfactory or poor use.

Schools with good ICT resources, that make very good use of those resources, achieved better results than schools with similar resources that made unsatisfactory or poor use of them.

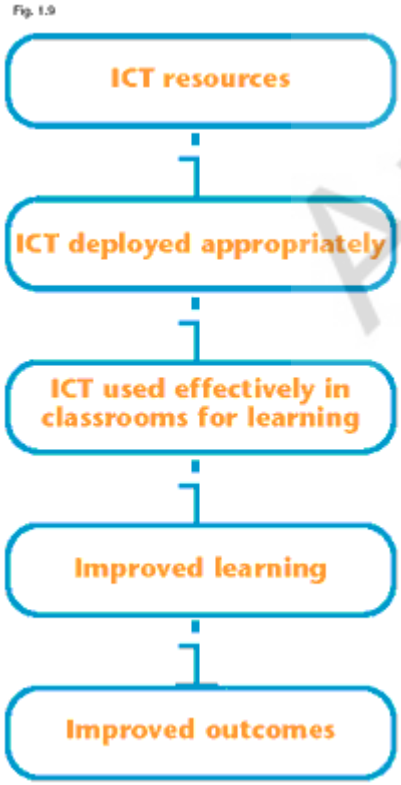
Fig. 1.8




## A developing model

Last year's report proposed a chain of relationships linking ICT resources to outcomes in key stage tests and exams. The way in which ICT resources were used was as crucial as their presence within a school.

Fig. 1.9




Where there is a statistical relationship between two variables, it requires judgement to determine the direction of the relationship. Interpretation depends partly on the statistical characteristics of the relationship itself, and partly on what is reasonable inference.

The correlation between quality of ICT resources and standards does not indicate causality. Socio-economic grade and leadership quality are other possible mechanisms. The results suggest that these factors do not explain the relationship between ICT resources and standards (see Is the socio-economic grade of the school a factor?), but it is important to seek further evidence. Last year's report provided a brief summary of a growing body of evidence that ICT can improve standards when used appropriately. This report will focus purely on a statistical analysis of the national data-sets from OFSTED and QCA.

The new OFSTED framework provides two new judgements:

- The strategic deployment of ICT resources in the school
- The quality of ICT learning opportunities for pupils.

These judgements allow a better examination of this model, and an analysis was carried out that looked at the relationship between these different ICT factors and standards.

## New evidence from OFSTED inspections

Figure 1.10 shows some of the results of applying this model to primary schools. Previous graphs have only compared the 'best' and 'worst' subgroups of schools.

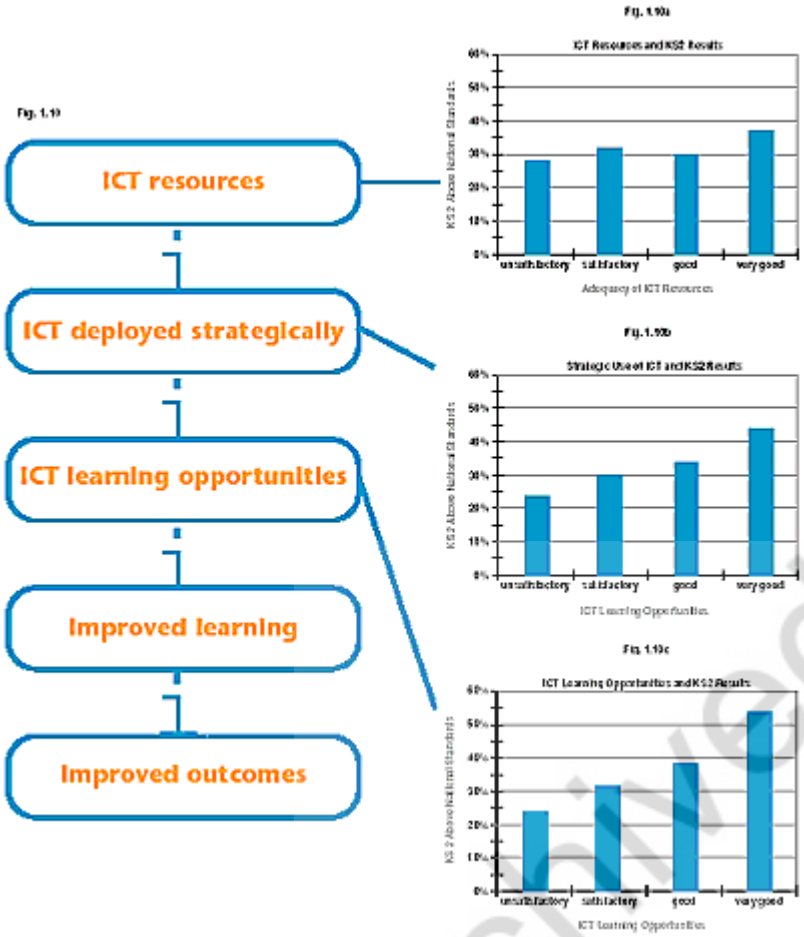
These graphs show results across the whole range. The scale along the bottom of each graph shows schools that were assessed by OFSTED as:

- unsatisfactory/poor
- satisfactory
- good
- very good.

The height of the bars represents the proportion of schools getting above average Key Stage 2 (KS2) results (this is a grade given by OFSTED, based on the combined value for English, mathematics and science KS2 test results).

It is clear from the graphs not only that the proportion of schools with above average standards increases as the ICT indicator improves, but that this effect is more marked for ICT indicators that are more closely linked to how well ICT is used in the classroom. Of the three ICT grades under consideration, the one most closely linked to KS2 outcomes is the provision of ICT learning opportunities to pupils in the classroom.

It is reasonable to assume, therefore, that the relationship between these factors operates in the direction shown by the arrow, but determining cause and effect is rarely possible for statistical data. The rest of the report looks at these relationships in more detail, but a more detailed model requires experimental data outside the scope of this research.






## Conclusions

This section investigated the relationships between ICT and standards found for schools inspected in 1998/99 in order to confirm for the new set of schools inspected in 2000.

Schools that were judged by OFSTED to have very good ICT resources had better achievement than schools with poor ICT. The difference between the two groups of schools has increased in comparison with the results for the previous year. The Very Good ICT schools had improved their performance and the Poor ICT schools had got worse overall.

When schools with similar socio-economic circumstances were compared, those with good ICT resources achieved better results than schools with unsatisfactory ICT. This indicates that the relationship between ICT resources and standards is not simply a result of 'better off' schools acquiring better ICT resources. It also suggests that good socio-economic circumstance for the school is not a pre-requisite for effective use of ICT.

When schools with similar quality of leadership were compared, those with good ICT resources tended to achieve better results than schools with unsatisfactory ICT. However, this relationship was not seen in schools with unsatisfactory leadership. Among these schools, the relationship between ICT resources and standards was negative. This was the only finding for 2000 that was different from 1998/99. It may indicate that leadership is a more significant factor in ICT use than previously suggested.

Schools where ICT was used well within a subject tended to get better results in that subject than other schools. Schools where good ICT resources were combined with good use of ICT tended to

gain better Key Stage 2 results than those with good ICT resources but poor usage. Schools that combined good ICT resources with good ICT teaching gained better results than those that had good ICT resources but poor ICT teaching. These results show that the presence of ICT resources alone is less important than the combination of good resources and effective use.

Last year's statistical analysis proposed a model linking schools' ICT resources and educational standards. The model developed suggested that ICT resources best supported improvement in standards where they were used effectively in the classroom to support learning. New OFSTED inspection judgements, available for the first time this year, allowed this relationship to be analysed in greater detail, in particular via the new grade given for 'ICT learning opportunities'. This year's analysis is statistical and cannot prove causality; however, it does provide evidence for the model and points to the conclusion that ICT is crucially dependent on how it is used in the classroom.

The analysis reported previously on schools' ICT resources and educational standards has been verified with a new sample of 1,252 schools inspected in the following year. This is strong evidence that the results in the first analysis were not statistical coincidences.

## Section 2 - Schools' readiness for ICT

Section 1 showed that considerable variation exists between schools in how they use ICT and that not all schools use it well. The variation in schools is considered in more detail in Section 6. This section provides an analysis of the factors that need to be in place to ensure good ICT learning opportunities for pupils. Section 6 will show that good or very good ICT learning opportunities occurred in 24% of schools. This factor is chosen because it is linked to better pupil learning and, as shown in Section 3, positive use in subjects for learning. The following paragraphs examine a range of factors to identify those that are essential to the development of good ICT learning opportunities in schools. These were chosen as the school and ICT factors that had the highest correlation to learning standards overall, and together represented a context for the learning process.

The following factors were tested:

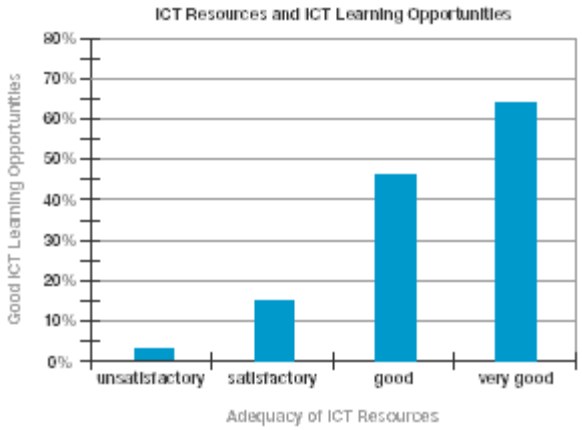
- Adequacy of ICT resources
- Leadership and management of ICT
- Leadership of the headteacher and key staff
- Quality of ICT teaching
- General quality of classroom teaching
- Social grade of the school
- Prior attainment of pupils.

The test applied was to determine whether the presence or absence of this factor produced a change in the incidence of good ICT learning opportunities, away from the national average of 24%? If this test gives a positive result (in particular, if ICT learning opportunities largely disappear in the absence of the factor) then that factor is likely to be significant for the development of ICT in schools. This section presents the results of this test, for all the factors listed above.

### ICT resources

Figure 2.1 shows the relationship between the adequacy of ICT resources (as judged by OFSTED inspection) and good ICT learning opportunities. Not surprisingly, only 3% of primary schools that have unsatisfactory or poor ICT resources provide good learning opportunities in ICT. As ICT resourcing improves, ICT learning opportunities also improve. Some 47% of schools with good ICT resources, and 64% of those with very good ICT resources, provide good ICT learning opportunities.

Fig. 2.1

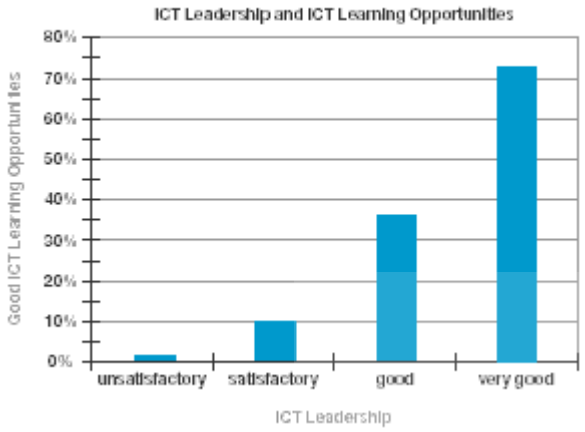



Good ICT resourcing is a necessary but not sufficient factor in offering good ICT learning opportunities, with approximately half of schools with good ICT providing good ICT learning opportunities. It is a crucial enabler but it is not the only one.

## ICT leadership

Figure 2.2 shows the distribution of learning opportunities related to ICT leadership. Where ICT leadership is unsatisfactory, only 1% of schools provide good learning opportunities in ICT. Although ICT opportunities are typically provided by the classroom teacher, the quality of leadership and management of ICT in a school is crucial to the provision of good ICT learning opportunities.

Fig. 2.2



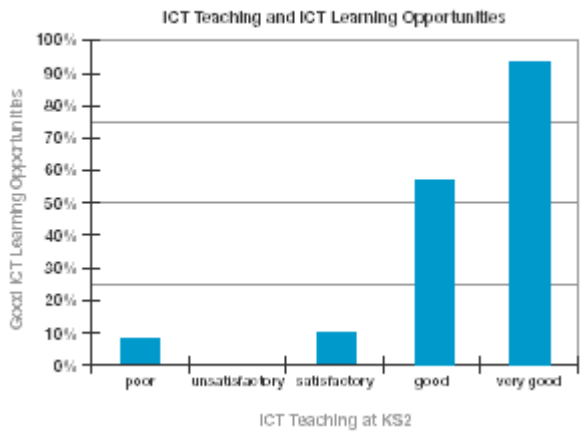

As the quality of ICT leadership improves, so does the percentage of schools providing high-quality ICT learning opportunities, so that 73% of those with very good ICT leadership provide good ICT learning opportunities.

Good ICT leadership is a crucial enabler to good classroom use of ICT, and 47% of primary schools have good or very good ICT leadership. However, it is not a sufficient factor on its own: only 40% of schools with good ICT leadership provide good ICT learning opportunities.

## ICT teaching

Figure 2.3 shows the relationship between ICT teaching and ICT learning opportunities. Where the teaching of ICT is not good in a school, it is extremely unlikely that pupils receive good ICT learning opportunities. Where ICT teaching is good, 55% of schools provide good ICT learning opportunities and, where ICT teaching is very good, this is over 90%.

Fig. 2.3



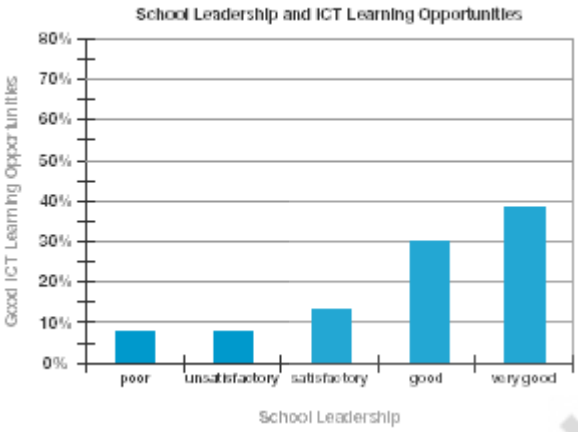

The distribution of the quality of ICT teaching across the range of schools is shown in Section 6. ICT teaching is poor or unsatisfactory in 35%, and good or better in 33% of primary schools.

Good ICT teaching is a crucial enabler for good ICT learning opportunities, though it is not sufficient by itself.

### General leadership of the school

OFSTED makes a judgement on the leadership of the headteacher and other key staff. The analysis of the quality of this leadership against good learning opportunities in ICT is shown in Figure 2.4. Where leadership is not 'good', only 10% of schools provide good learning opportunities in ICT, whereas 30% do when leadership is good or very good.

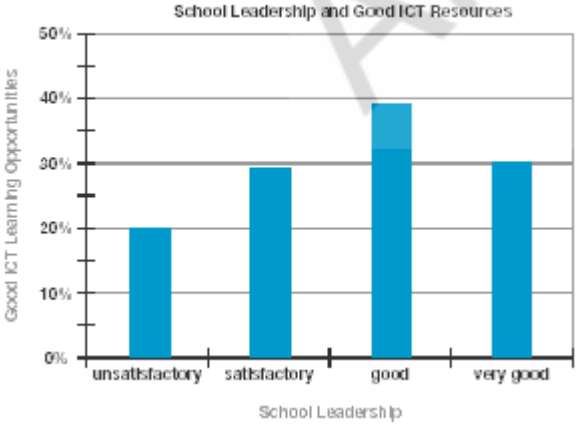
Fig. 2.4




This suggests that the quality of school leadership enables good use of ICT, although it is apparent that in some schools, other factors such as good teaching can compensate for poor leadership.

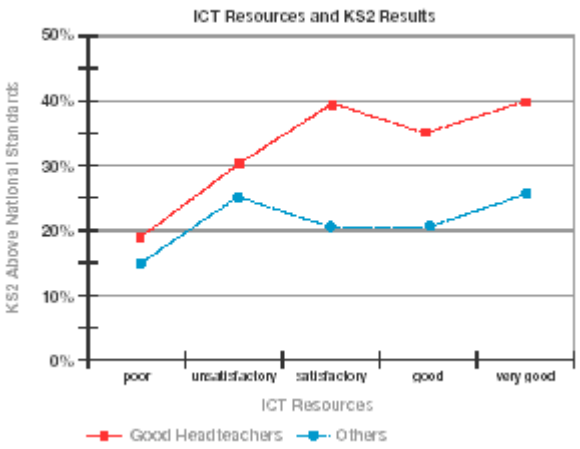
There is a clear link between school management and ICT. Part of this is related to ICT resourcing. Figure 2.5 shows that, generally, schools with good leadership also have better ICT resources.

Fig. 2.5




As well as having an impact on whether a school has good ICT resources, the quality of leadership also appears to have an impact on whether there is an improvement in standards related to ICT. Figure 2.6 shows the relationship between standards and ICT resources, but differentiating between good or better headteachers (the bottom, blue line) and others (the top, red line).

Fig. 2.6




Not unexpectedly, schools with good or very good leadership do better overall than those with poor leadership.

Generally, schools with good leadership and very good ICT have better results than those with good leadership but poor or unsatisfactory ICT. This confirms the results found in Section 1.

Generally, also as shown in Section 1, schools with satisfactory or worse leadership show little variation in standards associated with variation in ICT resources.

This suggests that any increase in Key Stage 2 standards related to ICT resources is mainly occurring in schools with good or very good leadership.

### General teaching quality

Figure 2.7 shows that, where general classroom teaching within a school is unsatisfactory, only 3% of schools offer good ICT learning opportunities, whilst 50% of schools where general teaching is very good offer good learning opportunities in ICT. Whilst OFSTED inspectors are likely to consider good use of ICT as one component of teaching quality, it is not a dominant factor in judging the teaching quality of a school. Section 6 shows that teaching is judged to be satisfactory or better in all but 9% of primary schools, and is good or very good in 64% of primary schools.

Fig. 2.7

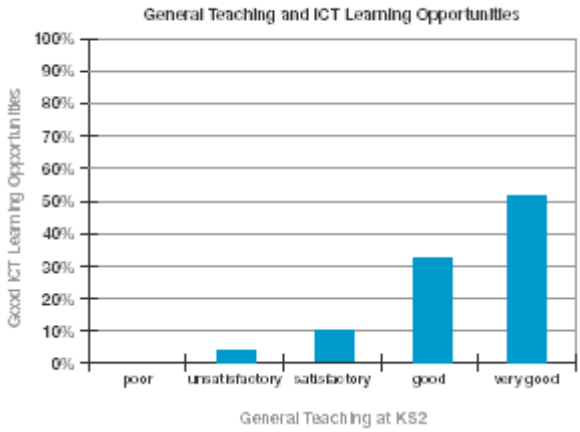



Figure 2.8 shows the relationship between the school's teaching and the teacher's understanding of ICT. It shows that 69% of schools with very good teaching, and 45% of those with good teaching,

have teachers with a good knowledge and understanding of ICT, as against 7% of schools with unsatisfactory teaching. There is therefore a close association between the general quality of classroom teaching and the teaching of ICT. Schools with less confident and capable teachers seem unlikely to provide good ICT teaching and good ICT learning opportunities in the classroom.

Fig. 2.8

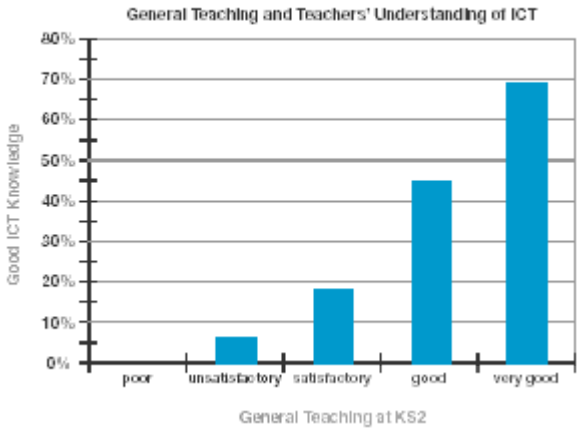
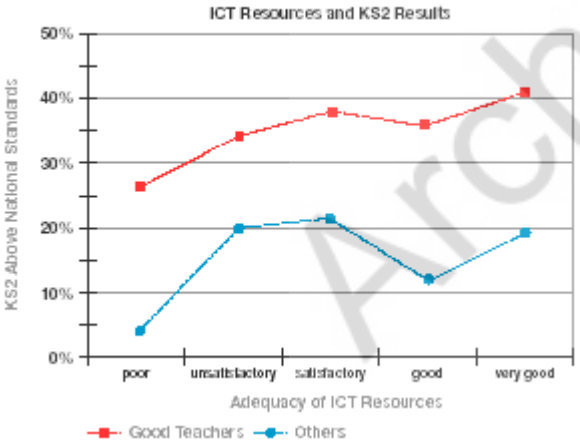



Figure 2.9 provides further evidence for this and shows the relationship between ICT resourcing and standards but splits the schools into two populations: those schools where the teaching is good or better, and the rest.

Fig. 2.9



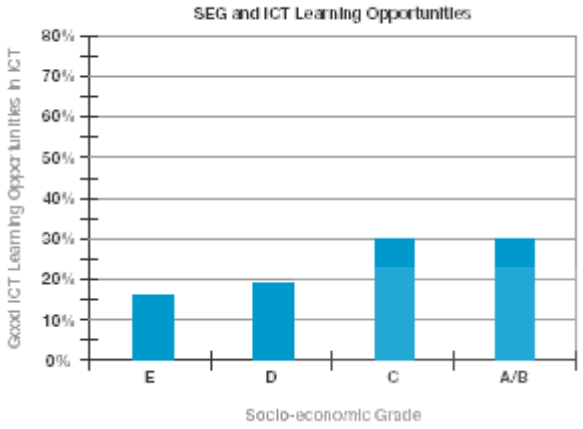

This shows that, as expected, on average, the schools with good teaching do better than others but also that schools with good teaching and good ICT get better results (41% above national standards) than schools with good teaching but poor ICT (27% above national standards). Schools where teaching receives a lower grade show little overall variation due to ICT resources and schools with good and very good ICT generally have worse results than those with satisfactory and unsatisfactory ICT. This suggests that any increase in Key Stage 2 standards related to ICT resources is mainly occurring in schools with good teaching.

### Social grade

Figure 2.10 shows that schools in higher social grades were slightly more likely to offer good learning opportunities in ICT than those in grades D and E. The analysis in Section 4 shows that this is not because they have better ICT resources, as all socio-economic groups have similar ICT resource profiles, but is probably because teaching is slightly better in higher socio-economic bands.

Clearly, social grade is not a crucial factor determining whether schools provide good ICT learning opportunities, but there is some increase towards higher socio-economic groups. However, low social grade does not prevent development of good ICT learning opportunities, and there are many schools in groups D and E that provide excellent usage of ICT.

Fig. 2.10



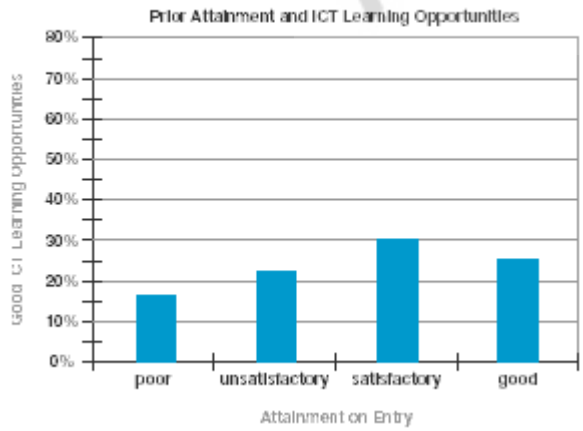

## Attainment on entry

Attainment on entry is a measure of the academic ability of pupils on entering the school. Figure 2.11 shows the relationship between attainment on entry and good learning opportunities in ICT.

There is no significant relationship between attainment on entry and ICT learning opportunities. There are many instances of schools which provide good learning opportunities in ICT and where pupils have low prior attainment.

Prior academic attainment is not a crucial enabler of ICT use in the classroom and ICT learning opportunities can be provided irrespective of the overall ability of the students.

Fig. 2.11




## Summary

The table below summarises the results for each of the factors.

**Table 2.1**

| Factor | Percentage of schools where ICT learning opportunities are good when ICT factor is | | | Necessary but not sufficient for good ICT learning opportunities |
|---|---|---|---|---|
| | unsatisfactory | good | very good | |
| **ICT resourcing** | 3% | 47% | 64% | Yes |
| **ICT leadership** | 1% | 36% | 73% | Yes |
| **ICT teaching** | 4% | 57% | 93% | Yes |
| **General teaching** | 3% | 32% | 51% | Yes |
| **School leadership** | 8% | 30% | 38% | (Yes ) |
| **Social grade** | 16% | 32% | (13%) | No |
| **High prior attainment** | 20% | 26% | (13%) | No |

Brackets indicate where data is based on a sample of fewer than 50 schools.

Section 6 shows that OFSTED judge that 24% of schools provide good or better learning opportunities. The grade for ICT learning opportunities is based on the inspectors' view of the quality and amount of opportunities provided for pupils to develop their ICT experience. Although this is related to ICT as a subject, Section 3 shows that this is closely linked to their use of ICT in English, mathematics and science. A figure in the table above that is close to 24% even when the factor is unsatisfactory shows that the factor is not necessary for good ICT learning opportunities. This is true for social grade of the school and prior attainment of the pupils. The only factor which approaches being a sufficient factor (one which would guarantee good ICT learning opportunities) is ICT teaching, and this is only when it is rated as very good as opposed to good.

## The number of ICT factors

The previous analysis has identified five factors - ICT enablers - that when judged to be good or better were necessary but not sufficient for schools to provide good ICT learning opportunities. Figure 2.12 shows good ICT learning opportunities against the number of crucial factors present. In eight out of ten schools where the ICT factors were all present, there were good ICT learning opportunities. Roughly half the schools with four out of five ICT factors in place offered good ICT learning opportunities. But other schools, with fewer than four factors in place, were very unlikely to offer good ICT learning opportunities to their pupils. This non-linear graph suggests that all these factors generally need to be in place before schools provide good ICT learning opportunities.

Figure 2.13 shows the distribution of these ICT factors present in the primary schools. Some 13% of primary schools had all five ICT enabling factors in place, and 26% had four or five.

Fig. 2.12

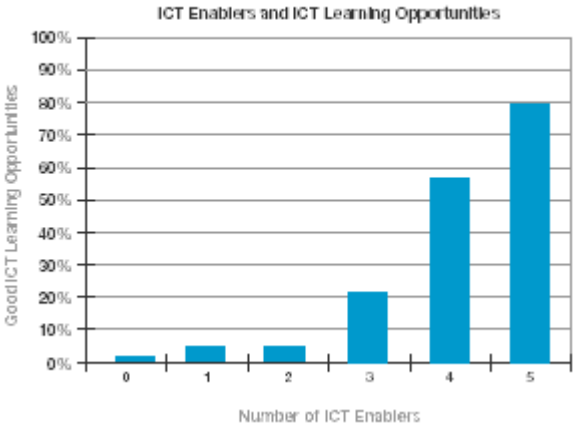
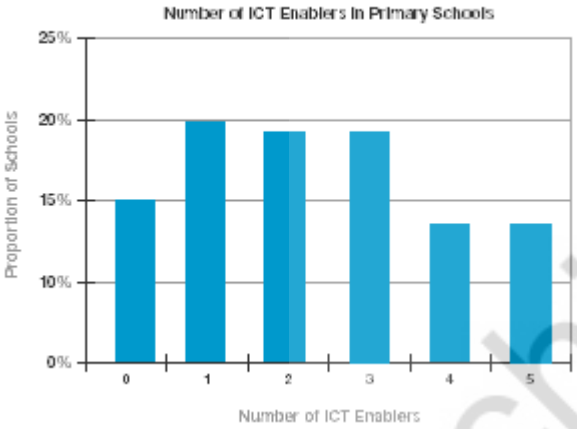


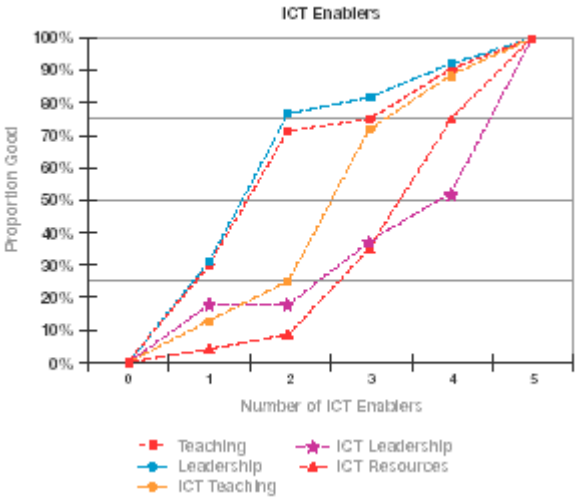

Fig. 2.13




## How factors combine

Figure 2.13 showed how many schools had ICT-enabling factors in place. Figure 2.14 shows the same type of relationship, but plots for each of the five groups of schools the percentage of that group that has a particular enabler in place.

Fig. 2.14



For instance, of the group of schools with three enablers, 82% have good general teaching, 75% good general leadership and 72% good ICT leadership, but only 38% good ICT teaching and ICT resources.

This graph does not show change over time but represents a snapshot picture of a number of populations of schools in the year 2000. However, it does suggest a number of tentative conclusions.

First, it points to the fact that the implementation of ICT follows a relatively logical progression. Schools usually have good general leadership and good general teaching before developing their ICT.

Second, the development of the ICT factors is also logical. ICT leadership tends to precede ICT teaching followed by ICT resources.

These results suggest that ICT implementation is relatively methodical; ICT resources are not being wasted in schools unable to take advantage of them. There are still significant numbers of schools which are ready to increase the quality of their ICT resources, supporting government policy commitment on spending on infrastructure.

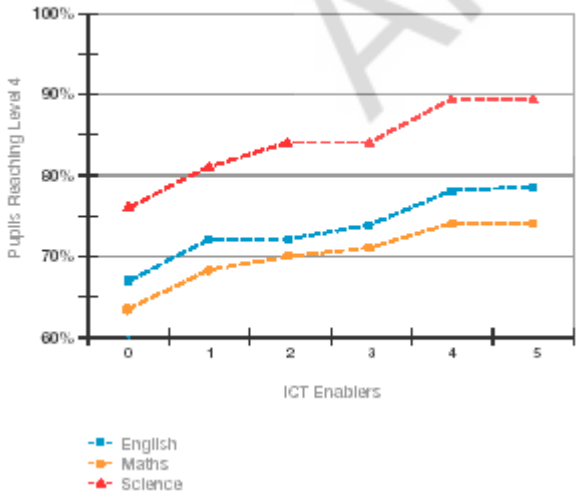
There is a corollary, however: there is concern for those schools that do not have the base levels of good leadership and teaching on which to build.

## ICT factors and attainment

Figure 2.15 shows the average proportion of pupils reaching attainment target level 4 at Key Stage 2 in relation to the number of ICT enabling factors in place. It can be seen that schools with more ICT factors in place tend to get better results. As well as any ICT factors, improvements in standards will of course come about through general teaching and leadership. However, Figure 2.14 showed that 80% of schools have both of these factors in place by group 2, and further improvements beyond this may be attributable to ICT factors.

Fig. 2.15

ICT Enablers and KS2 Outcomes




## Conclusions

This section identifies five factors that are essential to the development of good ICT learning opportunities in schools. These were identified from a list of seven school and ICT factors that had the highest correlation to learning standards overall, and together represented a context for the learning process. The five crucial factors are ICT resources, ICT teaching, ICT leadership, general teaching

and general school leadership. Two other variables - the socio-economic circumstances of the school and the prior performance of pupils - were not crucial. The analysis showed that each of these five factors was necessary but not sufficient. All five needed to be present in schools to ensure good ICT learning opportunities. Pupils' access to good ICT learning opportunities was dependent on the overall quality of a school's general teaching and general leadership.

Schools judged by OFSTED to have had good teaching generally had teachers with a good understanding of ICT, but those judged to be satisfactory or worse did not. Schools with good teaching and good ICT resources generally got better results than schools with good teaching with poor ICT.

Schools with good or very good leadership were nearly twice as likely to have good ICT resources as those with poor or unsatisfactory leadership. Schools with good leadership and good ICT had better results than schools with good leadership and poor ICT.

This points to a conclusion that most of the improvement in standards related to ICT resources was found in schools with good leadership and teaching.

An analysis of the schools and the five factors showed that 13% of primary schools had all five in place. Schools with good ICT factors usually had good general leadership and good general teaching. Schools with good ICT teaching usually had good ICT leadership, and schools with good ICT resources usually had all other factors in place. This suggests that ICT resources are not usually being wasted in schools unable to take advantage of them. It also shows that there are still significant numbers of schools which are ready to increase the quality of their ICT resources because they have the supporting factors in place. However, there were few schools which had developed good ICT learning opportunities without base levels of good leadership and good teaching. An important issue to consider is how schools with less than good leadership or teaching can be better supported with more accessible ICT to achieve success.

## Section 3 - ICT and subjects

In the new inspection framework, OFSTED makes judgements on two aspects of ICT: firstly on those ICT factors relating to ICT as a subject - ICT teaching, ICT learning opportunities and ICT achievement, and secondly on the quality of use of new technologies within a subject. Section 2 has identified five key factors that all have to be in place for the development of good ICT learning opportunities. A similar analysis available from the Becta website shows that these five factors are also needed for the good use of ICT in each of English, mathematics and science. This section looks further at the relationship between ICT, subject use and subject attainment.

### ICT learning opportunities and subjects

Figure 3.1 shows that pupils' achievement in ICT as a subject is strongly related to ICT learning opportunities. This is a relatively obvious finding, since pupils are unable to develop or show their ICT capability without good ICT learning opportunities.

Fig. 3.1

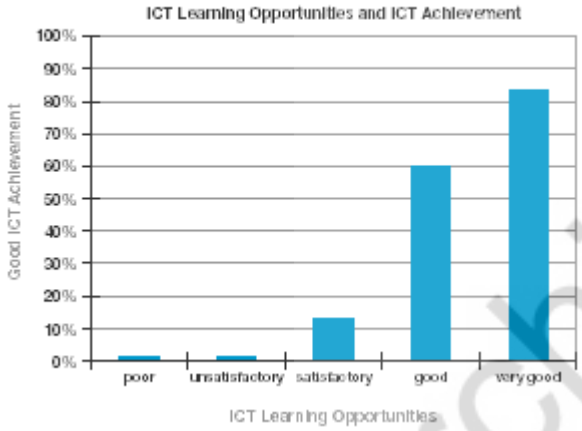



Figure 3.2 shows the relationship between ICT learning opportunities and ICT use in a subject. In English, mathematics and science, good use of ICT is strongly related to ICT learning opportunities, and ICT learning opportunities are strongly related to good use of ICT in English, mathematics and science. This supports the view that in most primary schools, where ICT, English, mathematics and science are generally taught by the same teacher in the same classroom, ICT capability is closely connected to ICT's use in subjects.

Fig. 3.2a

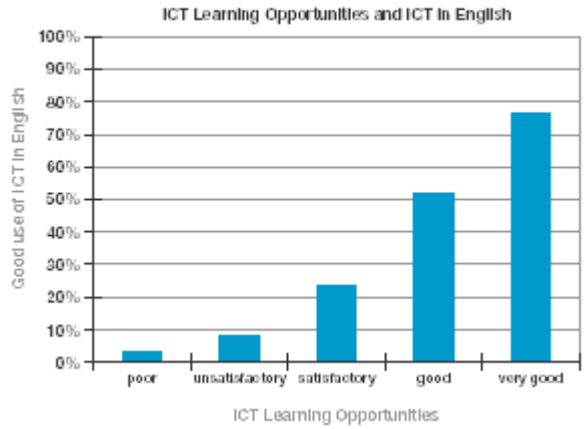


Fig. 3.2b

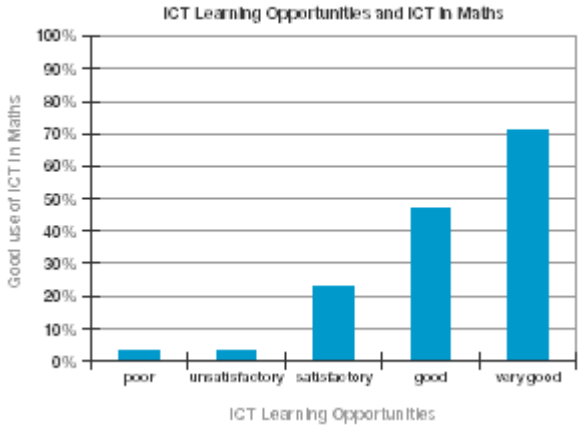
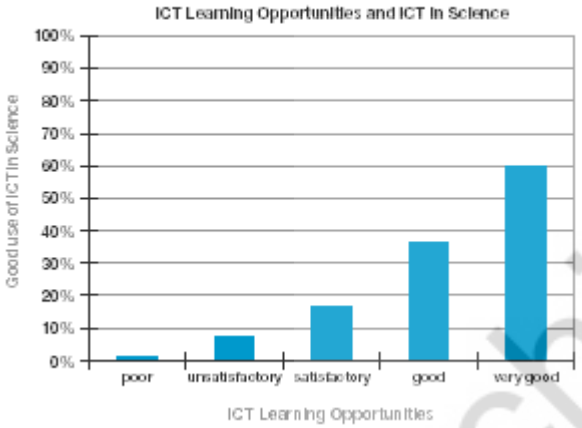



Fig. 3.2c




## Pupils' ICT attainment and ICT use in subjects

Figure 3.3 shows a similar relationship between pupils' ICT attainment and ICT use in subjects, illustrating that these are also linked. This suggests that for most primary schools ICT usage provides support for subject teaching and improved ICT skills.

Fig. 3.3a

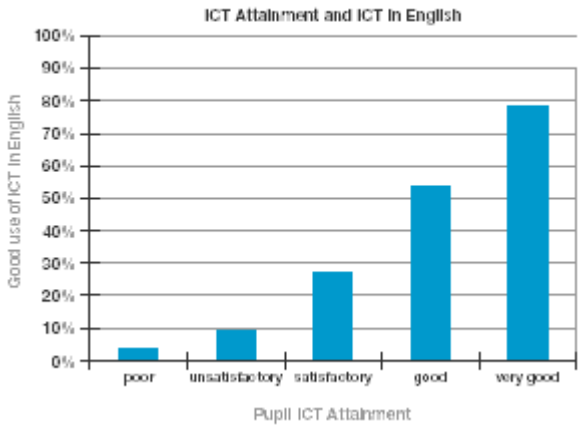



Fig. 3.3b

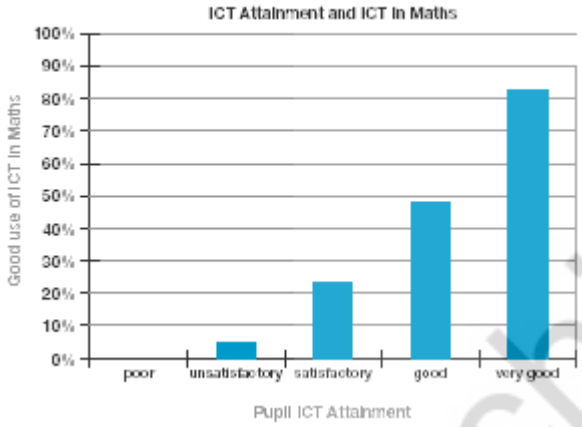
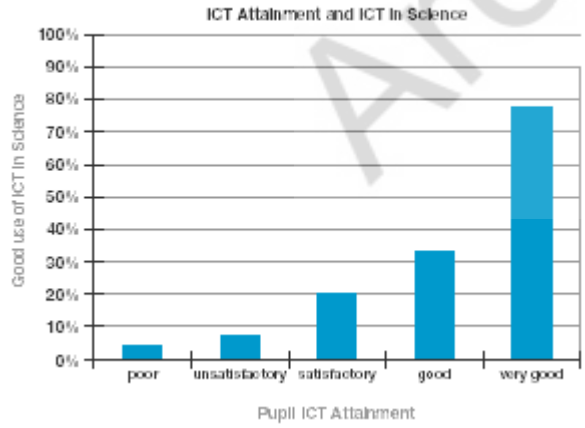



Fig. 3.3c






## ICT and teaching in the subject

Figure 3.4 shows that good use of ICT in mathematics is related to the quality of mathematics teaching. As shown in Section 2, there is a strong link between general teaching and ICT learning opportunities and this is reflected in subject teaching as well.

Fig. 3.4

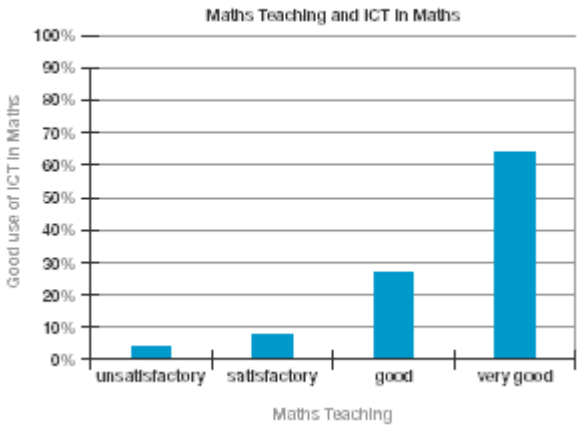
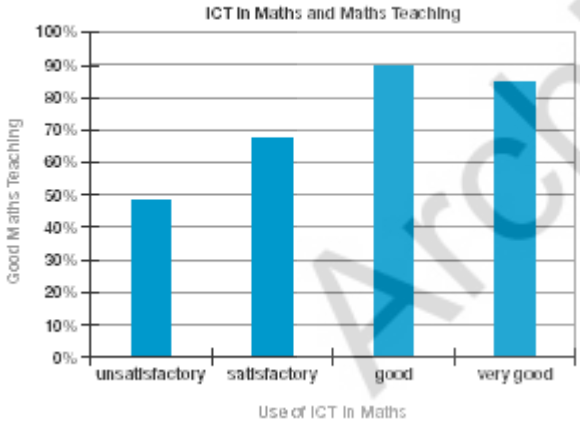



Figure 3.5 shows that, generally, the reverse relationship holds but is less pronounced. Where ICT is used well in mathematics, this is generally an indicator of good mathematics teaching, although there are schools where mathematics teaching is judged to be good but ICT is not well used. Good mathematics teaching is more common than good use of ICT in mathematics. Good mathematics teaching seems to be essential for good use of ICT in mathematics. Good use of ICT in mathematics is not essential for good mathematics teaching, but it makes it more likely. These relationships also hold true for science and English.

Fig. 3.5

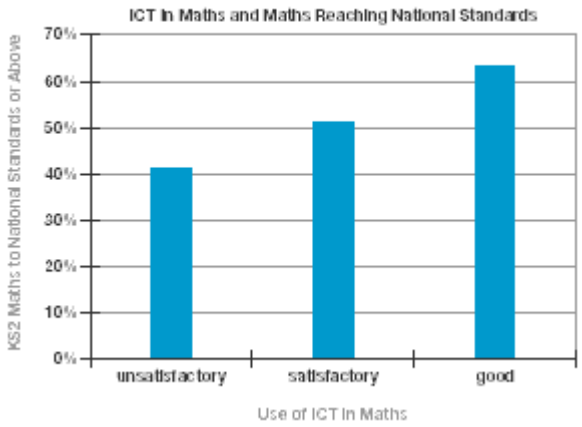





## Mathematics, ICT use and standards

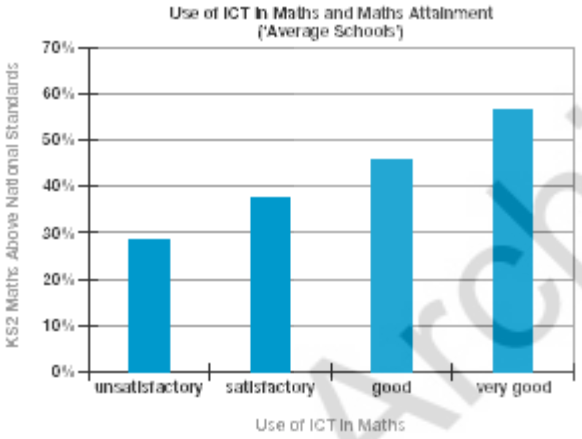
Figure 3.6 shows the relationship between ICT use in mathematics and Key Stage 2 mathematics standards. In general, 63% of schools with good use of ICT in mathematics have reached or exceeded national standards in mathematics, against 41% of schools with unsatisfactory use of ICT.

Fig. 3.6




This is not just because these schools are more privileged or have more able pupils. Figure 3.7 shows the same relationship for a sub-group of schools with average social grade and average prior attainment (grade C on both measures). Among these 'average' schools there is a strong relationship between use of ICT in mathematics and better mathematics results.

Fig. 3.7

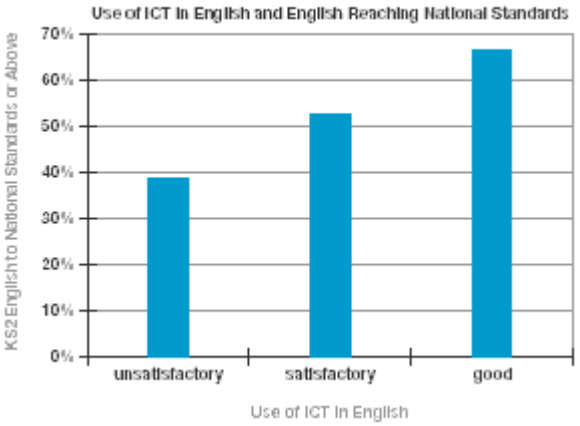





## English, ICT use and standards

Figure 3.8 shows a similar relationship between ICT use in English and Key Stage 2 English standards. In general, 66% of schools with good use of ICT in English have on or above national standards in English, against 39% of schools with unsatisfactory use of ICT.

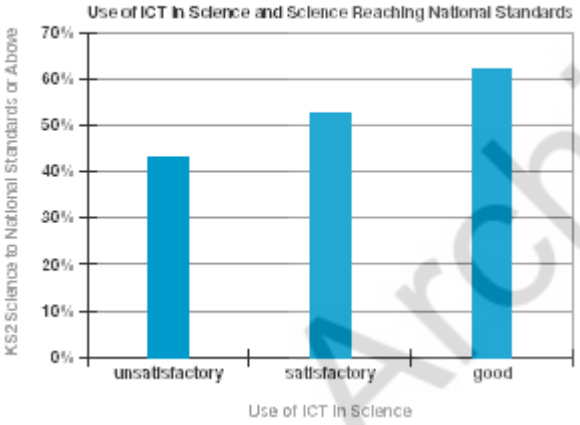
Fig. 3.8




## Science, ICT use and standards

Figure 3.9 shows the relationship between ICT use in science and Key Stage 2 science standards. In general, 62% of schools with good use of ICT in science have on or above national standards in science, against 43% of schools with unsatisfactory use of ICT.

Fig. 3.9






## All subjects

Table 3.1 shows the correlations between use of ICT in subjects against the Key Stage 2 (KS2) results in numerical form. Correlations are statistical functions used to show how closely two variables are related. They vary between -1 and 1, with negative numbers showing an inverse relationship. The graph for English in Figure 3.8 translates into a correlation of 0.19, but correlations were also determined for all relationships. The use of ICT in any curriculum subject was associated with improvements in all core subjects. Correlations between ICT use and better results were roughly equal regardless of subject. All of these correlations are statistically significant.

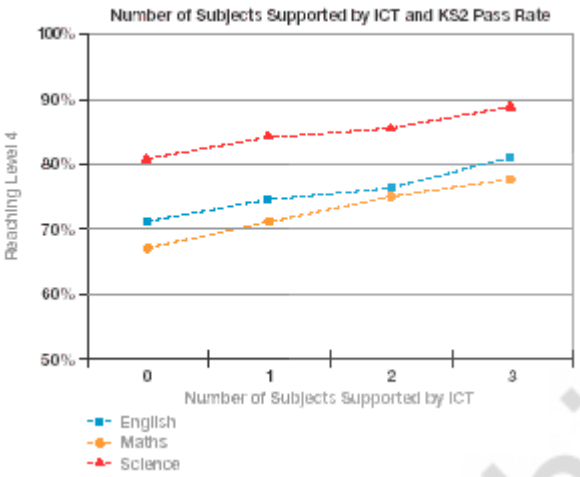
**Table 3.1**

| Correlation between subject use of ICT and results | Good use of ICT in | | |
|---|---|---|---|
| | English | Maths | Science |
| **English results** | .19 | .18 | .19 |
| **Mathematics results** | .18 | .18 | .17 |

**Science results** .14 .15 .14

Figure 3.10 shows the relationship between the use of ICT in one, two or all three subjects and KS2 results. The graph shows a marked and consistent rise in the average standards for all subjects as the number of subjects with good use of ICT increases from none to all three (English, mathematics and science). For English, the increase is from 71% to 82%. Science and mathematics show similar increases. This suggests a cumulative effect of ICT usage. It is possible that the use of ICT in subjects is associated with better general pupil learning in the school rather than subject-specific pupil learning.

Fig. 3.10




## Conclusions

ICT learning opportunities are strongly related to good use of ICT in English, mathematics and science. This supports the concept that in primary schools, where the same teacher in the same classroom generally teaches ICT, English, mathematics and science, ICT capability is closely connected to ICT use in subjects.

Where ICT is used well in a subject, this is generally an indicator of good subject teaching, although there are obviously many schools where subject teaching is judged to be good but ICT is not used. Good subject teaching seems to be essential for good use of ICT in that subject. Good use of ICT in a subject is not essential for good subject teaching, but it makes it more likely.

There is a strong relationship between the use of ICT and subject results. In general, 63% of schools with good use of ICT in mathematics are on or above national standards in mathematics, against 41% of schools with unsatisfactory use of ICT. The equivalent figures for English are 66% and 39%, and for science are 62% and 43%.

The use of ICT in any curriculum subject was associated with improvements in all core subjects. Correlation between ICT use and better results was roughly equal, regardless of subject. There is also a cumulative effect of ICT usage. The more subjects ICT is used for, the better the results across all subjects. There is a marked and consistent rise in the average standards for all subjects as the number of subjects with good use of ICT increases from none to all three (English, mathematics, science).

## Section 4 - Socio-economic factors

### Distribution of ICT for schools of different socio-economic circumstances

A key concern for education is the possibility of a 'digital divide'. Various initiatives have taken place to ensure that schools in difficult circumstances have as good, if not better, ICT resources than those in better circumstances. OFSTED inspectors place each school into one of seven socio-economic grades (A*-E*) based on their assessment of the neighbourhood from which the school draws its pupils. Grade A* is where the school is in the most advantaged socio-economic circumstances, and grade E* is in the least advantaged. Very few schools were given grades A* and E*, and these were combined with A and E. These grades were used in Section 1.

Figure 4.1 shows the distribution of ICT resources across social grades. It is clear from this diagram that good ICT resources are generally not biased to any one socio-economic group.

Figure 4.2 shows that schools in higher social grades were slightly more likely to offer good learning opportunities in ICT than those in grades D/E. This is not because they have better ICT resources, as all socio-economic groups have similar ICT resource profiles, but it may be because teaching is slightly better in higher socio-economic bands, as shown in Figure 4.3.

Fig. 4.1

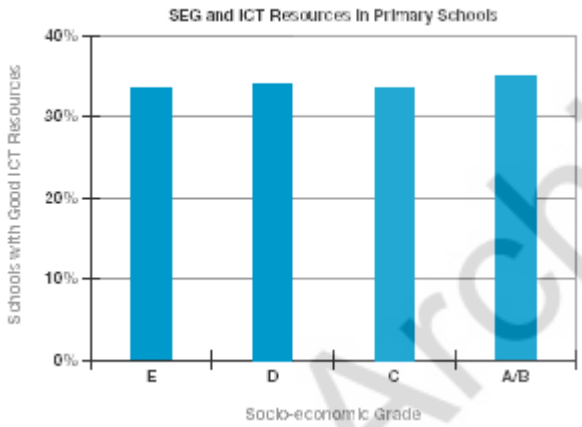


Fig. 4.2

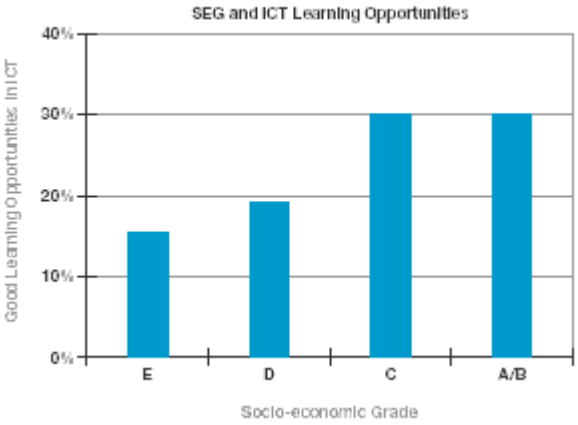
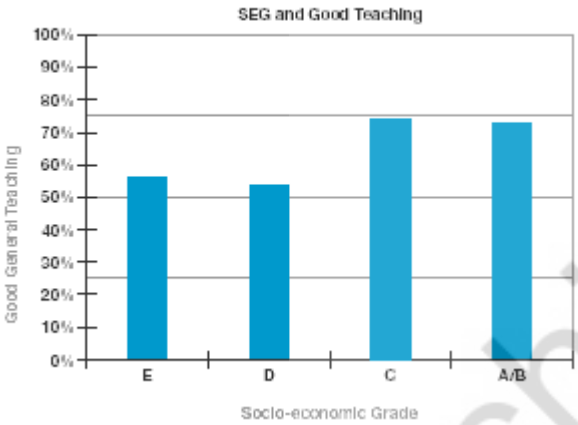



Fig. 4.3






## Subject results for different socio-economic grades

In general, schools in lower socio-economic grades (D and E) tend to achieve less favourable rates, as shown in Figure 4.4 for English. Overall, groups A and B are higher than C, which is higher than D and E. However, if these schools are banded in those with unsatisfactory, satisfactory and good ICT learning opportunities, it is clear that the better the ICT learning opportunities, the better the results are within that socio-economic grade.

Fig. 4.4

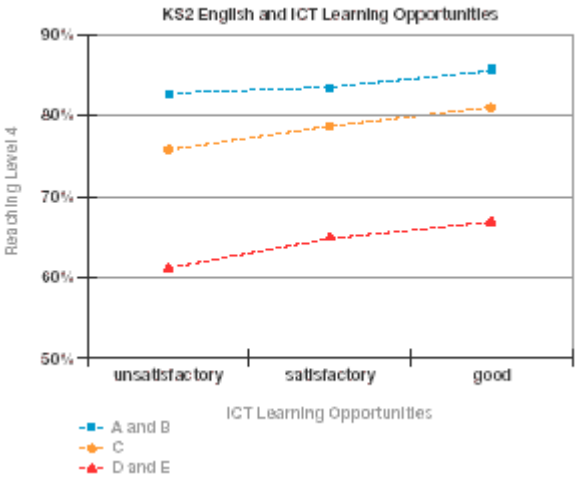


Figure 4.5 shows this analysis, but now relates each school's standards to the average for their socio-economic group rather than the national average. The graphs show that the relationship between ICT learning opportunities and standards in each subject for each socio-economic group follows a similar pattern. The analysis shows that the improvement in standards shown by schools with good ICT learning opportunities is true for all socio-economic circumstances.

Fig. 4.5a

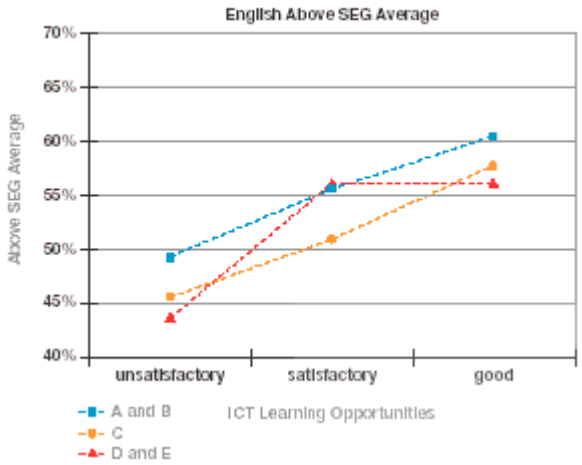



Fig. 4.5b

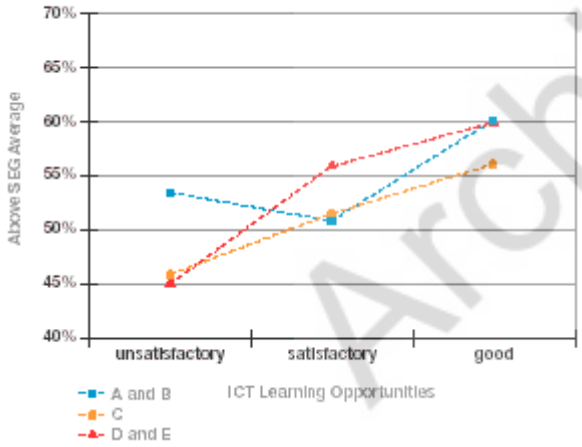



Fig. 4.5c

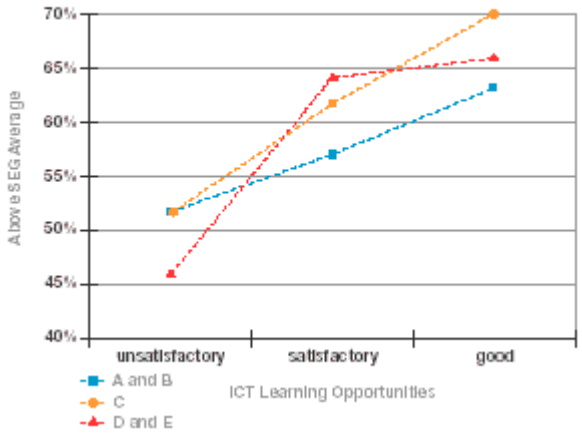


Figure 4.6 shows a similar analysis, but for ICT usage in subjects. It shows that, irrespective of socio-economic grade, where a school is categorised as having good use of ICT in that subject, on average it gets better results in that subject.

Fig. 4.6a

Use of ICT in English and English Results

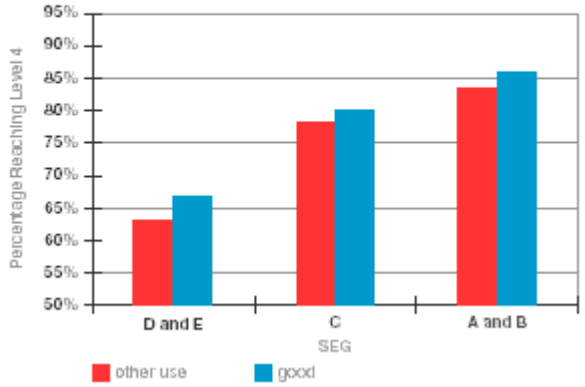



Fig. 4.6b

Use of ICT in Maths and Maths Results

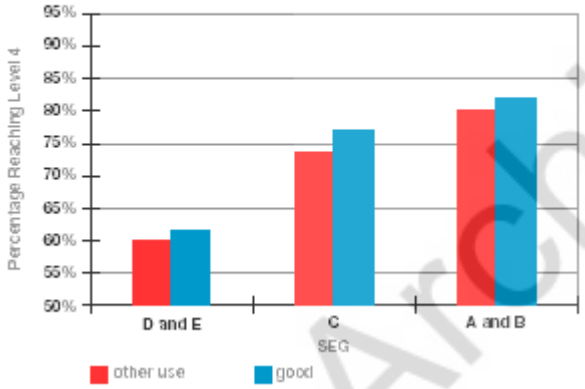
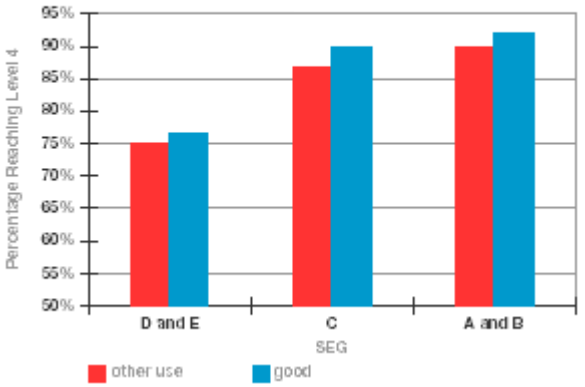



Fig. 4.6c

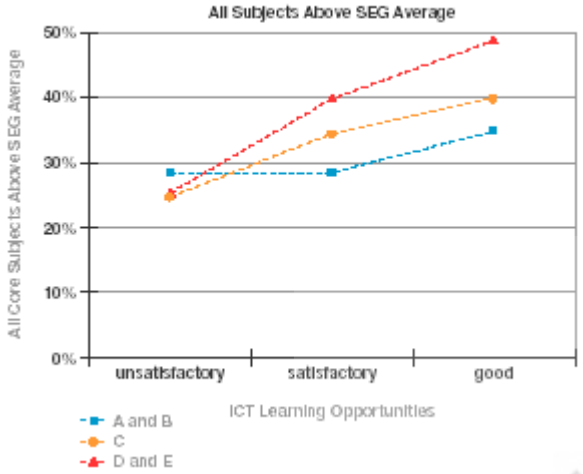
Use of ICT in Science and Science Results



## All subjects

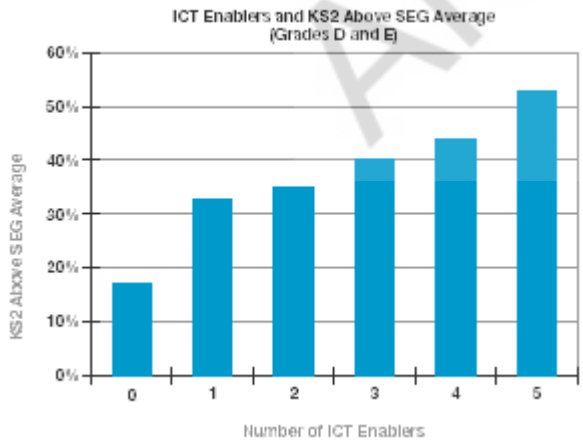
The previous analysis has shown the relationship to individual subjects. Figure 4.7 shows the relationship to schools with 'all core subjects results above the average for their socio-economic group'. This shows again that, for schools in groups D and E, the relationship between ICT learning opportunities and standards is as positive, if not more so, than for more privileged schools, when they are compared to schools in a similar group.

Fig. 4.7




In Section 2 it was shown that there were a number of factors that needed to be in place for ICT to lead to ICT learning opportunities and improved standards. Figure 4.8 is based only on schools in social grades D and E. It shows the proportion of schools achieving over the average for their socio-economic group (SEG) in all three core subjects. Schools are divided according to the number of ICT-enabling factors in place.

Fig. 4.8

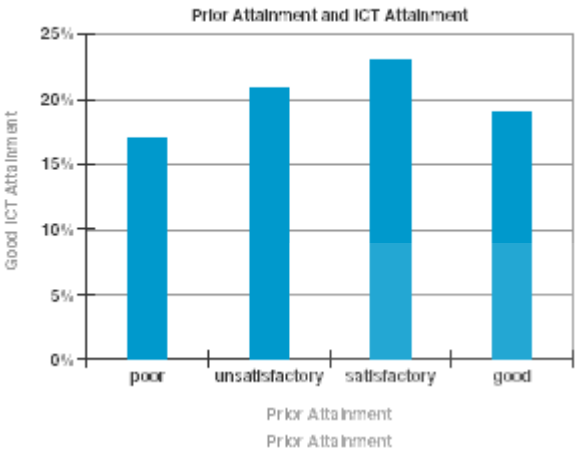



It can be seen that schools in lower social grades are much more likely to get above-average results if the ICT-enabling factors are in place in the school. These include ICT resources, ICT leadership and general teaching quality. This analysis suggests that schools in less privileged circumstances which are achieving over the average are providing good ICT learning opportunities and have factors such as good ICT teaching, leadership and resources. The implication is that schools in less privileged areas are able to make good use of ICT and this may well lead to improved standards.

## The relationship between ICT and socio-economic factors

Pupils' ICT attainment is a judgement made by OFSTED on pupils' attainment related to their ability. Figure 4.9 shows its distribution related to pupils' prior performance. Figure 4.10 shows its distribution related to socio-economic grade. ICT attainment is independent of socio-economic circumstances, and pupils' ICT learning can be as positive in schools in challenging circumstances, and with all abilities.

Fig. 4.9



Prior Attainment

Fig. 4.10

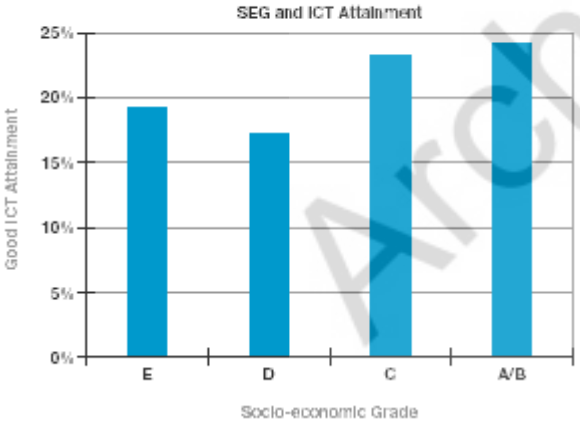



Figure 4.11 shows the relationship between pupils' ICT attainment and standards in each subject. As the overall pupil ICT attainment of a school increases, so do standards in each socio-economic category. The trend is more pronounced for schools in less favourable circumstances.

Fig. 4.11a

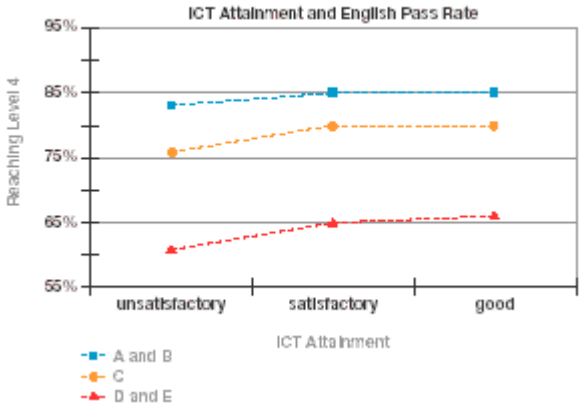



Fig. 4.11b

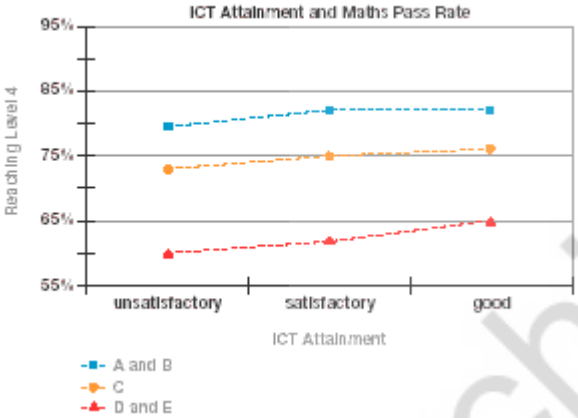
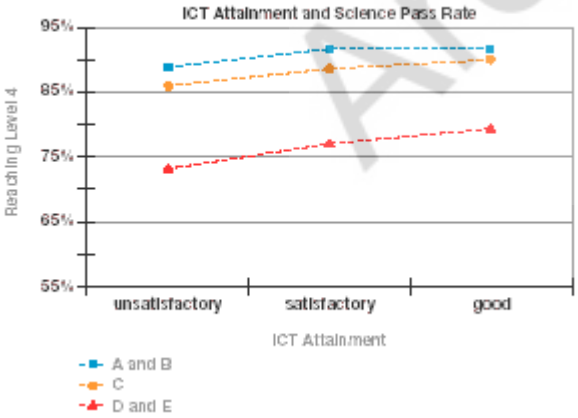



Fig. 4.11c






## Conclusions

The same proportion of schools in all socio-economic circumstances had good ICT resources. Schools in higher social grades were slightly more likely to offer good ICT learning opportunities than others.

The tendency for schools with good ICT learning opportunities to have better standards than those with worse ICT learning opportunities was true for all socio-economic circumstances. For schools in less privileged socio-economic circumstances the trend is as positive, if not more so, than for more privileged schools. Pupils' ICT attainment was generally independent of socio-economic

circumstances. Many schools in less privileged areas were able to make good use of ICT, and those that did had better standards than those who did not make good use of their ICT.

## Section 5 - Other positive outcomes

Whilst a key focus for this research has been to analyse the relationship between ICT and standards, it is also important to look at other outcomes, in particular pupil attitudes, behaviour and attendance, and parental views of the school. These are important in their own right, but they also have a secondary link to improved standards. It is clear that pupils who are well motivated, with parents who are supportive of the school, are likely to be more effective learners than the reverse.

### Pupils' attitudes

OFSTED inspectors make a judgement on pupils' overall attitude to the school based on their observation in lessons and of the school generally. Figure 5.1 shows how pupils' attitudes vary with ICT resourcing and ICT learning opportunities. In 45% of schools with very good ICT resources, pupils' attitudes are very good, compared to 29% for schools with poor or unsatisfactory ICT resources. In 56% of schools with very good ICT learning opportunities, pupils' attitudes were very good, compared to 25% for schools with poor or unsatisfactory ICT learning opportunities. There is a clear link in both instances, with the relationship being stronger where ICT learning opportunities are considered as opposed to just ICT resources.

Fig. 5.1a

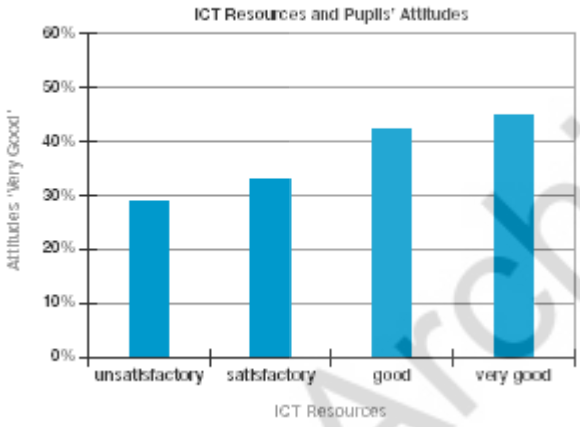
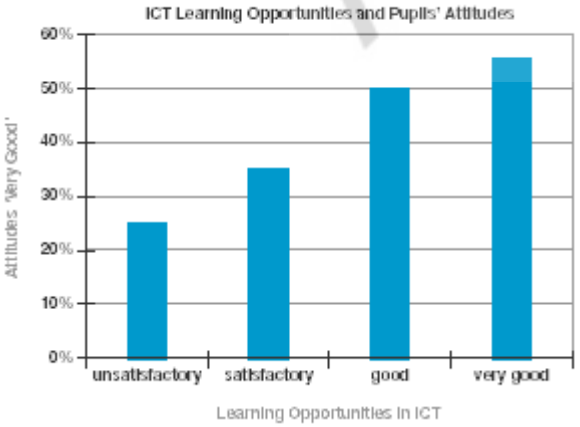



Fig. 5.1b




There is a positive relationship between ICT resources and pupils' attitude. In 45% of schools with very good ICT resources, pupils' attitudes are very good, compared to 29% for schools with poor or unsatisfactory ICT resources. This relationship is stronger if ICT learning opportunities are considered.

## Pupils' behaviour

Figure 5.2 shows a similar relationship but in terms of pupils' behaviour. In 43% of schools with very good ICT resources, pupils' behaviour is very good, compared to 25% for schools with poor or unsatisfactory ICT resources. In 50% of schools with very good ICT learning opportunities, pupils' behaviour is very good, compared to 23% for schools with poor or unsatisfactory ICT learning opportunities. These relationships need to be treated cautiously since, as we have seen earlier, schools with good leadership and good teaching are more likely to have better ICT resources and offer better ICT learning opportunities.

Fig. 5.2a

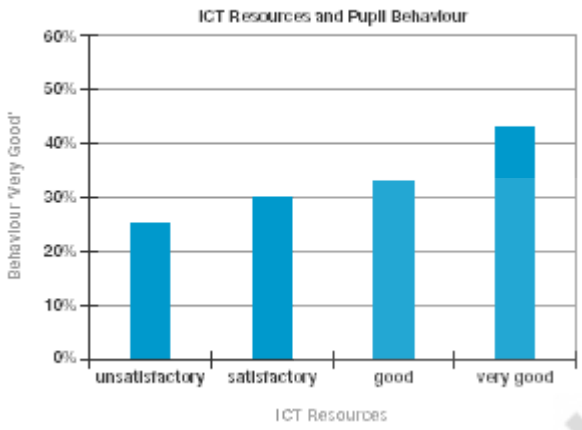
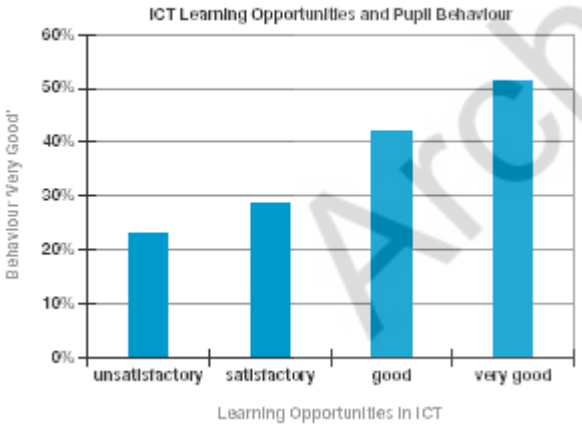



Fig. 5.2b




There is also a positive relationship between ICT resources and pupils' behaviour. In 43% of schools with very good ICT resources, pupils' behaviour is very good, compared to 25% for schools with poor or unsatisfactory ICT resources. This relationship is again stronger if ICT learning opportunities are considered.

## Parental views

OFSTED also makes judgements about parents' views of the school, based on their observations and meetings with parents. This shows a similar pattern. In 43% of schools with very good ICT resources, parental attitudes are very good, compared to 25% for schools with poor or unsatisfactory ICT resources. In 51% of schools with very good ICT learning opportunities, parents' views are very good, compared to 20% for schools with poor or unsatisfactory ICT learning opportunities. Similar caution needs to be added to the interpretation of this data, as with that of pupils' behaviour.

Fig. 5.3a

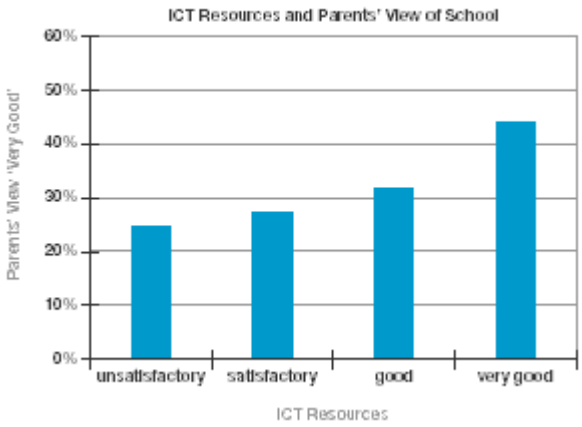
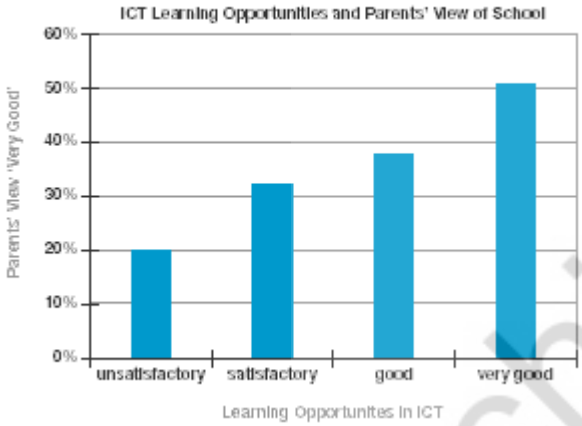



Fig. 5.3b




There is also a positive relationship between ICT resources and parental attitude. In 43% of schools with very good ICT resources, parental views of the school are very good compared to 25% for schools with poor or unsatisfactory ICT resources. This relationship is again stronger if ICT learning opportunities are considered.

## Attendance

Figure 5.4 shows a relationship between ICT learning opportunities and attendance. In 51% of schools with good or very good ICT learning opportunities, pupils' attendance was good, compared to 34% of schools with poor or unsatisfactory ICT learning opportunities.

Fig. 5.4a

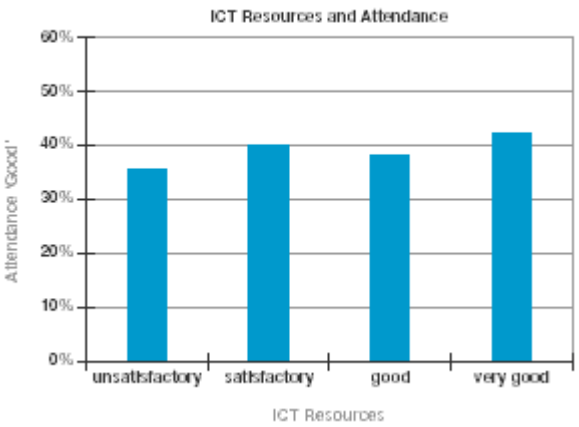
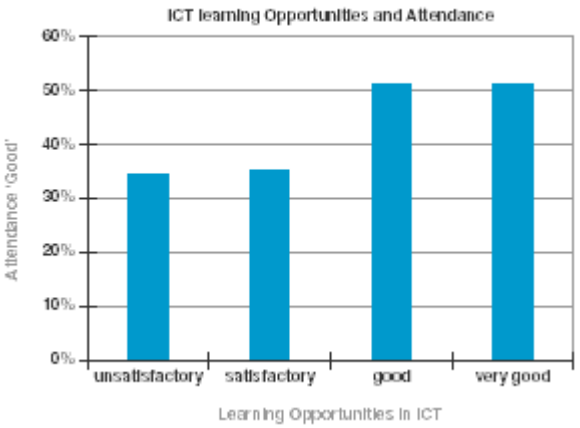


Fig. 5.4b




The relationship between ICT resources alone and primary school attendance is not statistically significant.

There is a positive relationship between ICT learning opportunities and school attendance.

## Learning

Figure 5.5 shows the relationship between ICT and the judgement by OFSTED of the quality of Key Stage 2 learning. Learning is good in 80% of schools with very good ICT resources. Learning is also good in 93% of schools with very good ICT learning opportunities, although there is probably a considerable degree of overlap between these two judgements.

Fig. 5.5a

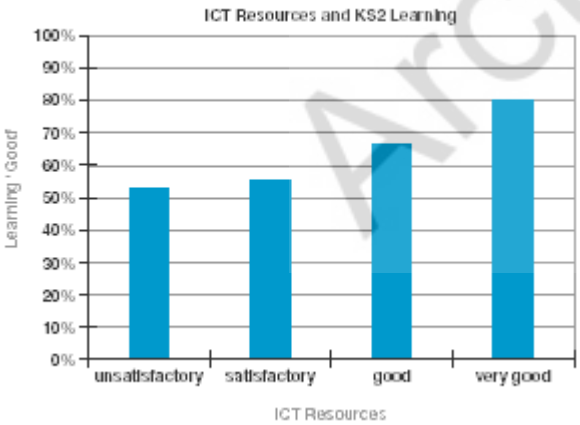
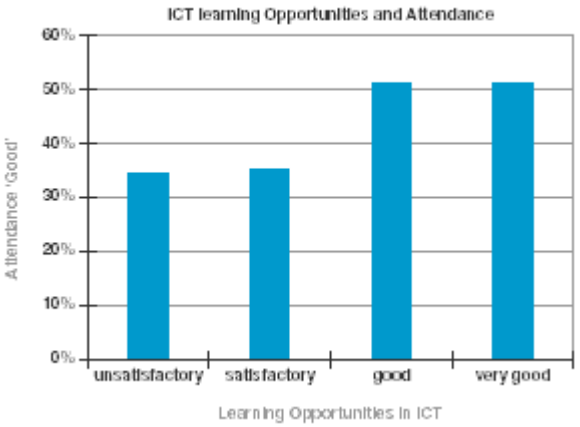


Fig. 5.4b




## Pupils' ICT skills

Pupils' ICT skills are an important outcome of ICT use in schools, in their own right. This covers three areas: ICT attainment, pupils' intellectual and creative effort in ICT, and their general interest and enthusiasm.

The first graph in Figure 5.6 shows the relationship between these three positive factors and the quality of ICT resources in a school. There is a dramatic positive relationship. Schools with good or very good ICT resources are much more likely to have pupils with intellectual and creative effort in ICT, ICT attainment, and interest and enthusiasm in ICT.

The central graph in Figure 5.6 shows the relationship of these factors to the strategic deployment of ICT resources within the school. Where ICT resources, of whatever quality, are well used, pupils are much more likely to show effort and interest, and to produce good work in ICT. The final graph in Figure 5.6 shows the relationship with the grade awarded by OFSTED for teachers' understanding of ICT. In schools where teachers have a good or very good understanding of ICT, pupils are much more likely to take an interest in ICT, make a good effort in ICT, and produce ICT work of a good standard.

Fig. 5.6a

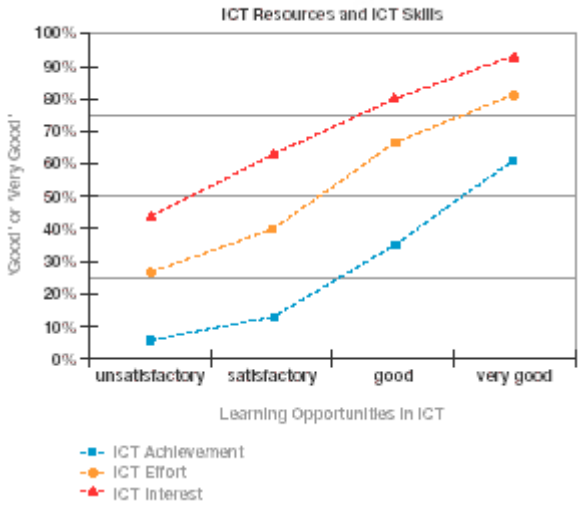


Fig. 5.6b

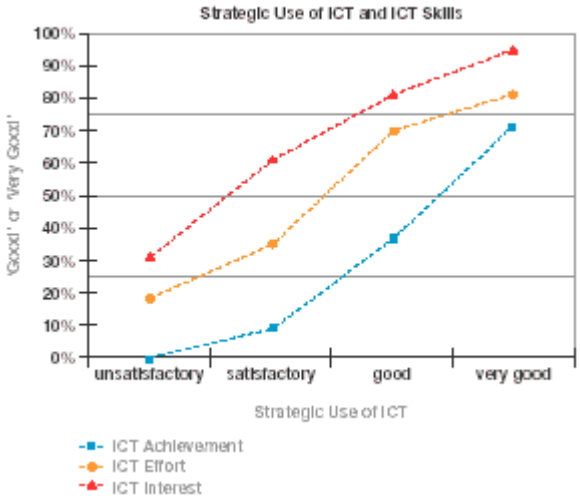
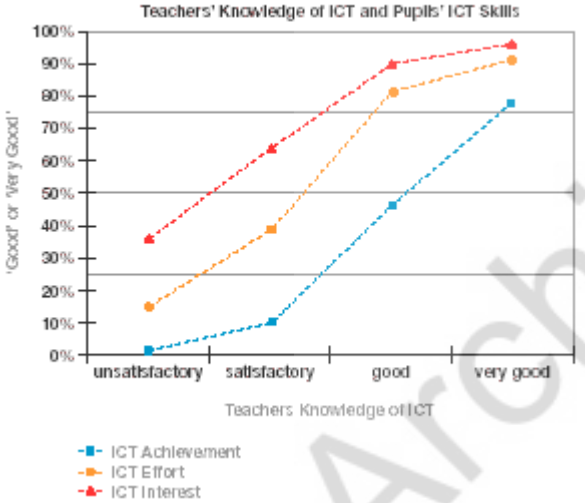



Fig. 5.6c






Pupils' effort and interest in ICT, and the standard of ICT work seen, are not entirely related to factors which are external to the school. Schools with good resources and good deployment of resources, and where teachers have good ICT skills, tend to encourage the development of ICT skills among pupils.

### Pupils' ICT skills and attainment

Figure 5.7 shows that these factors have a strong positive association with good educational outcomes at Key Stage 2. Schools where pupils make an effort in ICT lessons, take an interest in ICT, and produce a high quality of work in ICT, also tend to obtain good results in other subjects. One possible explanation for this association is that better effort in ICT, and higher standards of ICT work, are entirely the result of social factors. For example, pupils in more privileged schools tend to gain better grades for effort and attainment in all subjects. Is this the only reason for the association between work in ICT and educational outcomes?

Fig. 5.7a

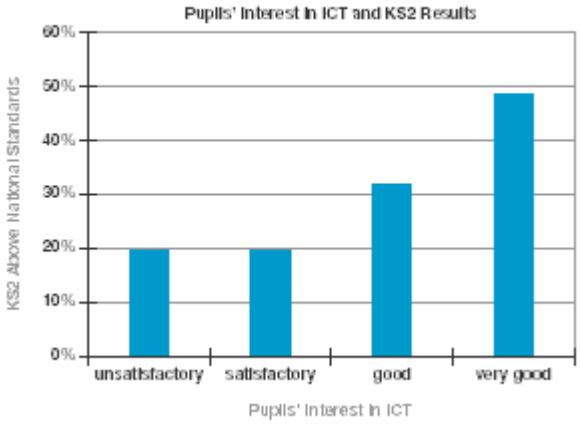



Fig. 5.7b

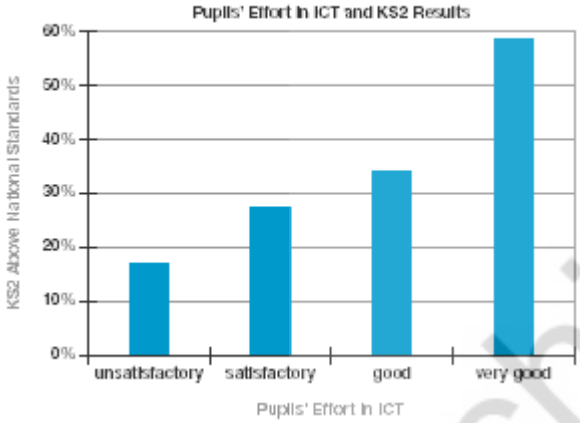



Fig. 5.7c

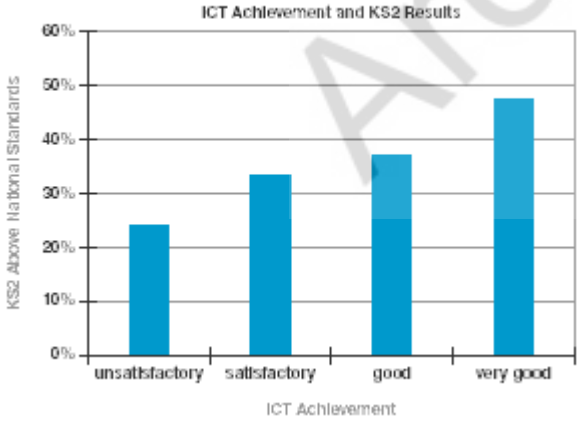



Figure 5.8 shows schools' educational attainment in comparison to other schools of the same social grade.

Fig. 5.8a

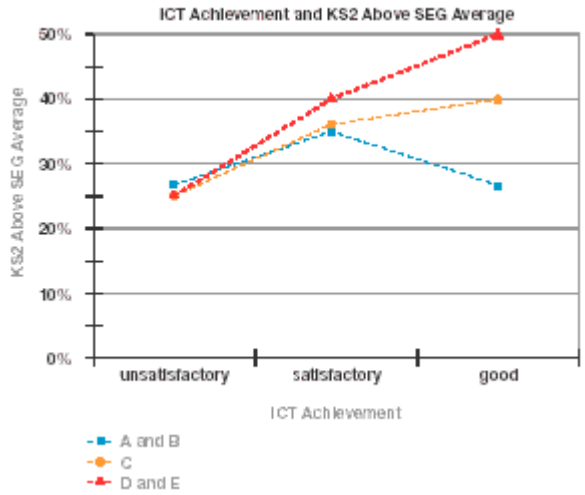



Fig. 5.8b

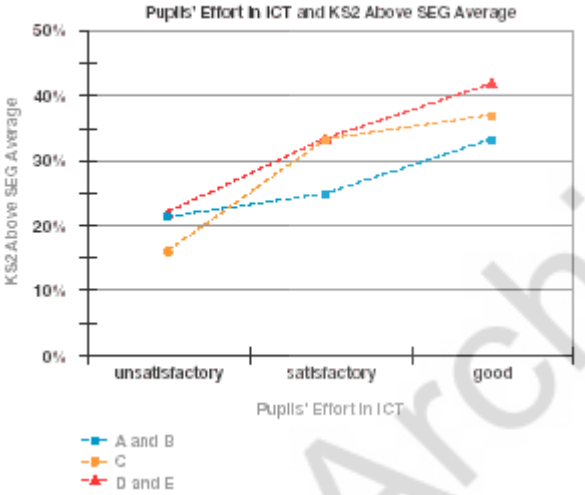
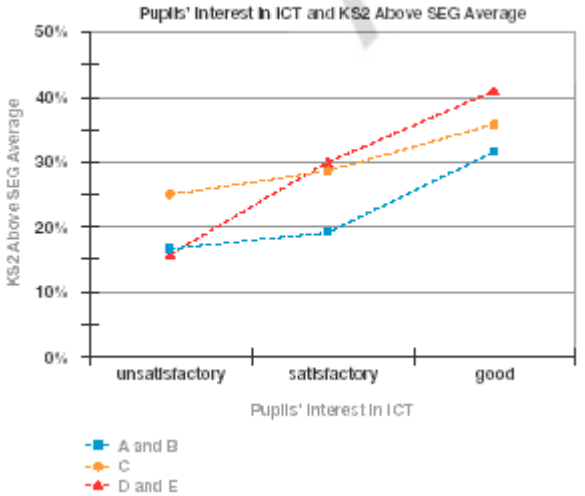



Fig. 5.8c




The conclusion is that schools tend to achieve better results than schools in the same socio-economic circumstances, if pupils show interest and concentration in ICT lessons, make a good effort in ICT, and produce ICT work of good standard.

The strong positive relationship between ICT grades, and pupils' behaviour, attitudes and attendance and parental views suggests that there is an association between good use of ICT in schools, and better motivation of pupils and parents, and that this supports improved school ethos and improved learning. There is likely to be a degree of overlap between these different OFSTED judgements, and they are all likely to be related to each other.

## Conclusions

The pupils in schools with very good ICT resources were generally judged to have better attitudes and behaviour than those with poor or unsatisfactory ICT resources. This relationship was stronger if ICT learning opportunities were considered.

Schools with very good ICT resources were generally judged to have better parental attitudes than those with poor or unsatisfactory ICT resources. This relationship was again stronger if ICT learning opportunities were considered.

These findings suggest an association between good use of ICT in schools and the motivation of pupils and parents, although it could be interpreted in two ways - good ICT could help develop good school ethos and home links, or schools with good ethos and home links could develop good ICT.

There was a strong relationship between pupils' attainment, effort and independence in ICT and the quality of ICT resources, their deployment and teachers' understanding of ICT. This is relatively independent of socio-economic factors. Whilst the home environment may be effective in developing some ICT skills, the ICT environment of the school is important in developing ICT capability in the wider national curriculum context.

## Section 6 - The variation between schools

This section looks at the whole population of schools and analyses how they differ in their ICT factors and what effect this has on standards.

### The variation of ICT resource levels

Figure 6.1 shows the overall distribution of OFSTED judgements on the quality of ICT resources. The distribution is similar to that in the previous year, although ICT resources in schools have improved. It is possible that inspectors' criteria for very good ICT increased between 1998/99 and 2000.

Fig. 6.1

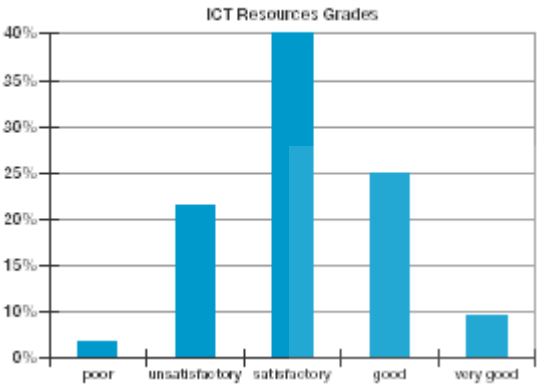



Figure 6.2 shows the average proportion of pupils reaching level 4 in English for the groups of schools defined in Figure 6.1. Results are similar for mathematics and science. This graph shows that Key Stage 2 (KS2) standards tend to be rather higher for schools with better ICT resources.

Fig. 6.2

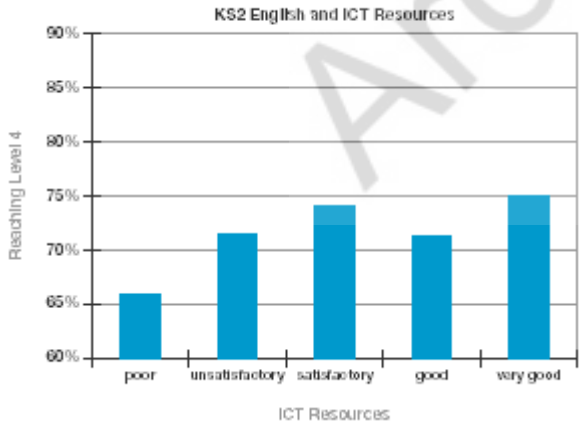
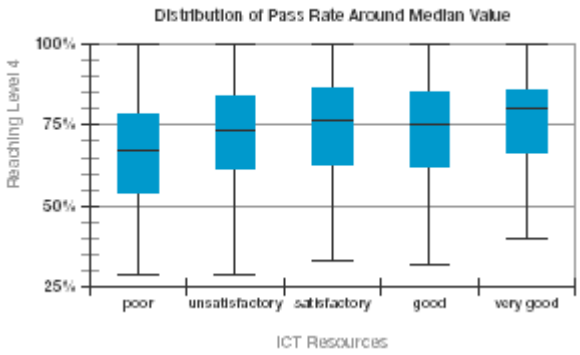



Figure 6.3 is a different type of graph, a 'boxplot'. It shows the full range of values from which the averages in Figure 6.2 were obtained. Some 50% of schools fall into the range shown by the blue boxes, around a median value; the lines above and below the boxes indicate the full range of variation.

Fig. 6.3




In each group of schools, defined in terms of ICT resources, there is a wide variation in the actual results obtained. Although on average schools with very good ICT do better than those with poor ICT, there are many individual schools which do not follow this pattern. This is partly because of the effect on KS2 results of other factors which have nothing to do with ICT. However, some of the variation in results may be explained by differences in the way the resources are used. The population of schools with 'very good ICT resources' includes schools where the resources are well used, and other schools where use of resources is unsatisfactory or poor. It has been shown that there is a substantial variation in results associated with these differences in use.

### The variation of the strategic use of ICT resources

Figure 6.4 shows the distribution of grades given for strategic use of ICT resources. In 23% of schools the strategic deployment of ICT is poor or unsatisfactory. This includes many schools with good resources.

Fig. 6.4

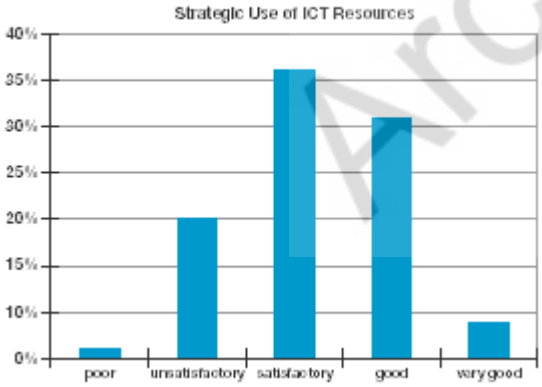



Figure 6.5 shows the average pass rate in English associated with each grade given for strategic use of ICT resources. There is an improvement in Key Stage 2 (KS2) English standards as the strategic use of ICT resources improves. Similar results are seen for science and mathematics.

Fig. 6.5

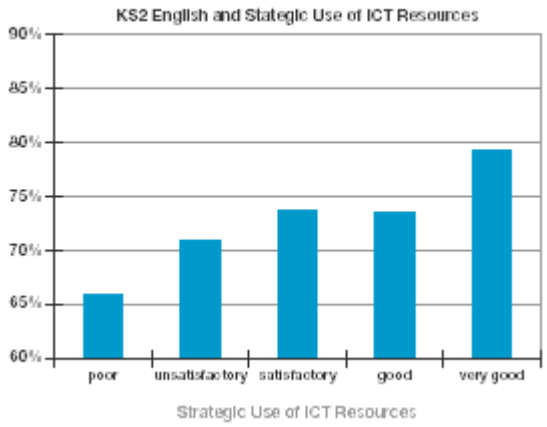
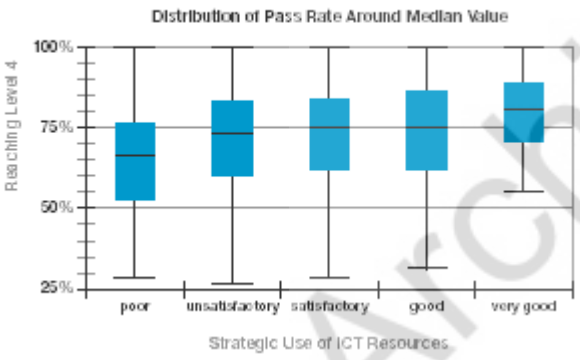



Figure 6.6 shows the distribution of KS2 English results around the median. Although there is a spread of results associated with very good strategic use, it is clear that there is less variation than that seen for very good ICT resources. This is in line with suggestions that good use of resources is more closely associated with improvements in standards, than the simple presence of resources in schools.

Fig. 6.6






## The variation of ICT learning opportunities

Figure 6.7 shows the distribution of grades given for ICT learning opportunities. Although there are only 6% of schools which are judged by OFSTED to offer poor ICT learning opportunities, there are 35% which are judged to be unsatisfactory.

Fig. 6.7

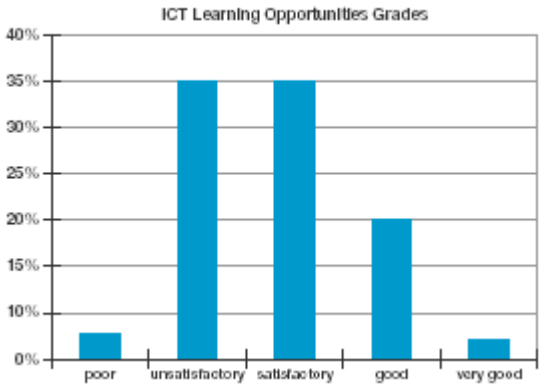


Figure 6.8 shows the average pass rate in English associated with each ICT learning opportunities grade. There is a strong increase in the average Key Stage 2 (KS2) school results as the quality of ICT learning opportunities increases.

Fig. 6.8

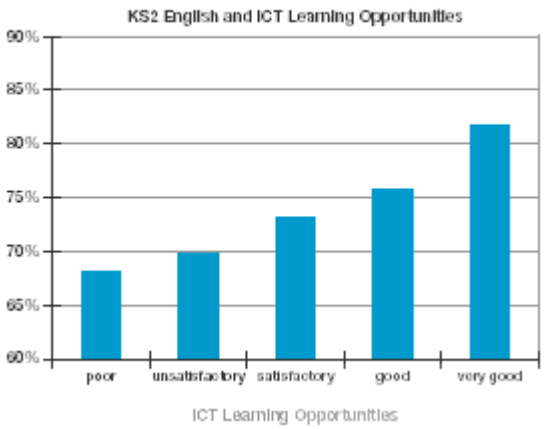
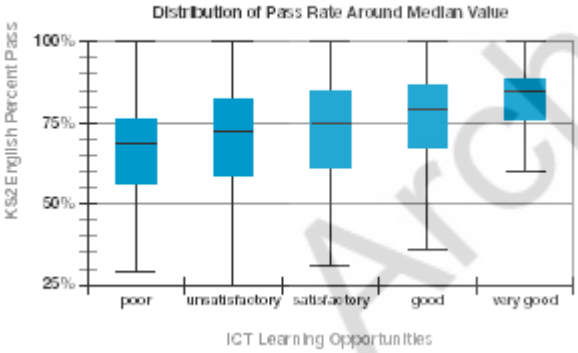



Figure 6.9 shows the distribution of KS2 English results around the median. It is clear that, although there is some variation in results among schools with very good ICT learning opportunities, it is much less than that associated with very good ICT resources.

Fig. 6.9






## The variation of ICT leadership

Figure 6.10 shows the distribution of grades given for leadership and management of ICT, and overall school leadership. Grades for ICT leadership vary more than grades for general school leadership. Fewer schools achieve high grades for ICT leadership.

Fig. 6.10a

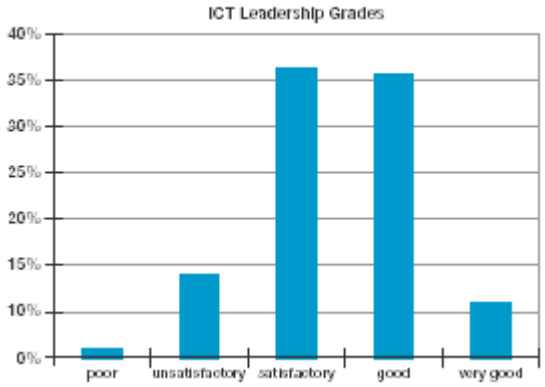
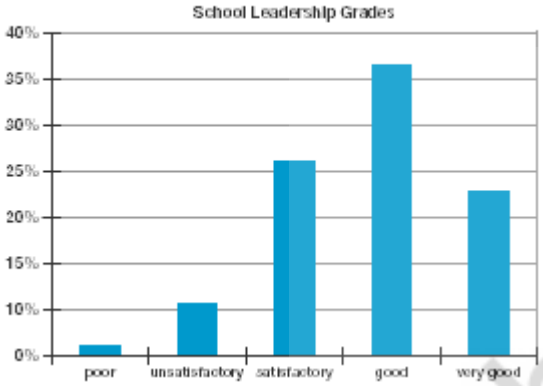



Fig. 6.10b

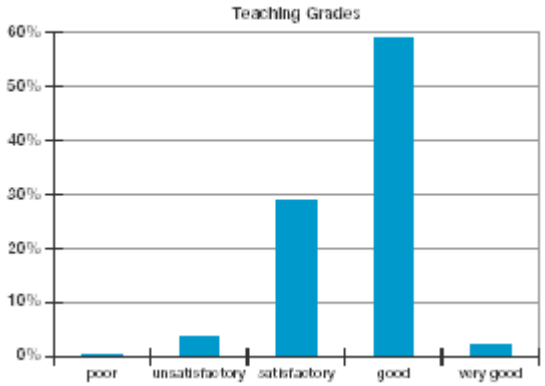



## The variation of ICT teaching

Figure 6.11 shows the distribution of grades given for ICT teaching compared to general teaching. It is clear that there is a much wider variation for ICT teaching. Much lower grades tended to be given for ICT teaching than for general teaching. Some 35% of schools received an unsatisfactory or poor grade for ICT teaching, compared to only 7% for general teaching.

Fig. 6.11a

Fig. 6.11b



## Conclusions

The variation seen between schools in relation to ICT variables was large, and greater than for many general school factors. ICT resources varied between schools. There was considerable variation in key stage attainment between individual schools in each band but this was least when ICT learning opportunities were very good.

Comparing the range of values given by OFSTED for general school leadership to those for ICT leadership, the average level of school leadership was generally higher than that for ICT leadership. Comparing general teaching grades to ICT teaching grades, again the ICT grades were generally lower, with over one-third poor or unsatisfactory. The differences between schools are large, which may reflect the variation in the quality of the use of the ICT as well as other factors. There is a need to improve the quality of ICT leadership, ICT teaching and ICT use in the classroom in order to reduce these wide differences.

## Appendix 1 - New OFSTED Framework

From January 2000, OFSTED used a new inspection framework. Two forms of inspection were carried out: a 'full' inspection, on the majority of schools, which included a detailed inspection of ICT features and facilities; and a 'short' inspection, which took much less time and recorded only the general features of the school, not including ICT. Schools are selected for short inspection on the following criteria:

*"Their previous inspections were good, they have good test and examination results compared to national standards, and to similar schools, with positive trends over time."*

This change in the inspection framework has had an impact on:

- the number of schools available as a research sample
- the type of schools included in the research sample.

### Impact on the number of schools

A short inspection provides no data on ICT factors and these schools were therefore removed from the analysis, reducing the sample by 30%.

**Table A.1**

| | **Primary** |
|---|---|
| **Total inspected** | 1,797 |
| **Given full inspection** | 1,254 |
| **Given short inspection** | 543 |

### Impact on the type of schools

The OFSTED criteria for short inspection removed from the sample a significant number of successful schools. As an example, Figure A.1 shows the effect on the distribution of Key Stage 2 (KS2) mathematics results.

This had an impact on the overall achievement of the sample as shown in Table 2.2. The 'long inspection' schools achieved significantly lower average attainment in KS2 mathematics and English

and, unlike schools given a short inspection, have yet to reach national targets.

Fig. A.1

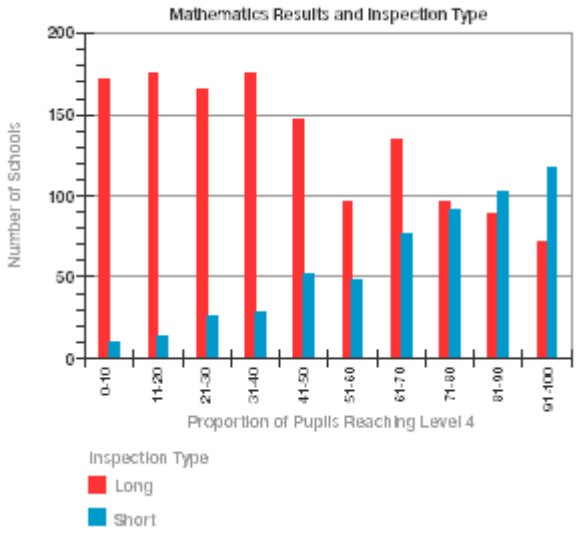



**Table A.2**

| | KS2 English | KS2 Maths |
|---|---|---|
| **Average attainment rate (all schools)** | 77% | 74% |
| **Average (short inspection)** | 86% | 84% |
| **Average (long inspection)** | 73% | 70% |
| **Target for 2002** | 80% | 75% |



## Comparison with previous reports

Compared to previous years, where the analysis was made for all schools, indicators of academic performance in this report show lower standards overall. This is also true for sub-samples (for example, schools with good ICT resources). Previous Becta research has demonstrated that high-achieving schools are more likely to have good ICT features, and the removal of more successful schools will tend to underestimate the effect of ICT. The previous report identified the parameters relating to successful use of ICT - identifying a cohort of 'Schools of the Future' - in general data is no longer available on these.

## Additional judgements

In addition to changes in the inspection method, several new judgement criteria have been added to the inspection framework. Many of these offer useful new perspectives on the ICT features of schools.

## Sample weighting

While OFSTED inspects all schools in the country on a rolling programme, the new inspection system means that a proportion of these schools are given a short inspection, which does not include ICT grades. Schools are selected for 'short inspection' on the basis of sustained success in national tests and exams.

Becta wishes to 'weight' the sample of schools given a full inspection, which includes ICT grades, to reflect the composition of the population of all inspected schools. This will facilitate comparison with earlier years, in which all schools received an ICT rating.

### Weighting factor

The sample to be weighted consisted of the 1,254 junior and junior/infant schools given a full inspection.

The factor chosen to weight the sample was the grade given by OFSTED for composite KS2 attainment in all core subjects.

### Source data

Table A.3 shows the distribution of KS2 composite attainment grades in the two sub-samples and in the total sample.

Table A.3

| KS2 composite grade | Schools given full inspection | Schools given short inspection | Total schools inspected |
|---|---|---|---|
| **A** | 191 | 295 | 486 |
| **B** | 188 | 130 | 318 |
| **C** | 262 | 76 | 338 |
| **D** | 196 | 22 | 218 |
| **E** | 415 | 18 | 433 |
| **Missing** | 2 | 2 | 4 |
| **Total** | 1,254 | 543 | 1,797 |



### Composition

Table A.4 compares the distribution of grades in the sub-sample to be weighted with the distribution in the total sample.

**Table A.4**

| KS2 grade | Total sample | Full inspection sub-sample |
|---|---|---|
| **A** | 27.10541% | 15.2556% |
| **B** | 17.73564% | 15.016% |
| **C** | 18.85109% | 20.9265% |
| **D** | 12.15839% | 15.655% |
| **E** | 24.14947% | 33.1470% |

### Proposed weighting

In order to bring the composition of the sub-sample into line with the total sample, the following weighting factors must be applied.

**Table A.5**

| KS2 Grade | Weighting factor |
|---|---|
| **A** | 1.776751 |
| **B** | 1.181118 |
| **C** | 0.900823 |
| **D** | 0.776648 |
| **E** | 0.728557 |

## Weighted sample

Once these weights have been applied, the weighted sample has the following composition.

| Grade | Number of schools in weighted sub-sample | Composition of weighted sub-sample | Composition of unweighted total sample |
|---|---|---|---|
| **A** | 339.3595 | 27.1054% | 27.10541% |
| **B** | 222.0502 | 17.7356% | 17.73564% |
| **C** | 236.0156 | 18.8511% | 18.85109% |
| **D** | 152.2231 | 12.1584% | 12.15839% |
| **E** | 302.351 | 24.1494% | 24.14947% |
| **Total** | 1,252 | 100% | 100% |

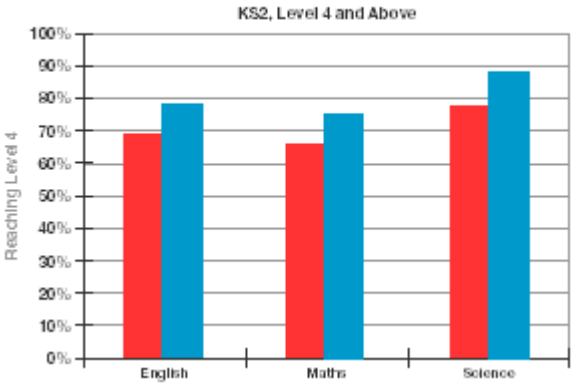
The weighted sample of schools given a full inspection therefore matches the composition of the sample of all inspected schools.

## Effects of weighting

Figure 1.1 compared average pass rates in English, mathematics and science between schools with very good ICT resources, and schools with poor ICT resources. There was a significant difference between the two groups.

Figure A.2 repeats this analysis, but for the weighted sample. Because the highest achieving schools were under-represented in the original sample, they received the highest weightings. The result of weighting has therefore been to increase the average pass rates within each sub-sample. However, the net difference in results associated with ICT resources has not been affected.

Fig. A.2




We therefore conclude that, while changes in the sample resulting from the new OFSTED system have resulted in a reduction in standards among the sample of schools given a full inspection, they have not reduced or augmented any variation associated with the presence of ICT resources in schools. The analysis in this report therefore makes use of the unweighted sample.

# Appendix 2 - The sample

## The data

Data was obtained from OFSTED and from QCA on all of the 2,673 schools inspected in the spring and summer terms of 2000. Of these 1,797 were primary schools with pupils taking Key Stage 2 (KS2) tests, and 292 were secondary schools covering Key Stages 3 and 4 (KS3 and KS4). The remainder were schools such as infant schools and special units, which fall outside the parameters of the research. As explained in Appendix 1, ICT data was not collected for schools given the new 'short' OFSTED inspection, which does not include ICT judgements, and these are also excluded from the research sample for all ICT analysis.

## OFSTED data

The analysis used the grades awarded by OFSTED inspectors to schools inspected between January and August 2000. This represents all of those schools that were inspected under the new framework during that academic year. During an inspection the team record judgements on a large range of measures. Generally, each is judged on a seven-point scale:

A* - Excellent
A - Very good
B - Good
C - Satisfactory
D - Unsatisfactory
E - Poor
E* - Very poor

Because Grades A* and E* were rarely awarded, these two grades are amalgamated with the next nearest categories to give five grades A-E producing a more valid statistical sample.

## QCA data

Data was obtained from QCA on the national tests at KS2 and KS3 and GCSE exams taken in the summer of 2000.

QCA test results were used in two ways:

- The number of pupils reaching national target levels was divided by the total number of pupils taking the test, to give a percentage pass rate for the school.
- The number of schools achieving above national standards in each test was divided by the total number of schools, to give a percentage rate above national standards.

The attainment targets used were:

- Level 4 or above at KS2
- Level 5 or above at KS3
- 5 or more GCSEs (grade C or above) at KS4.

### Conclusions

Data was obtained from OFSTED and from QCA on all of the 2,673 schools inspected in the spring and summer terms of 2000. Of these 1,797 were primary schools with pupils taking KS2 tests, and 292 were secondary schools, the remainder being schools outside the parameters of the research. Of schools within the parameters of the research, 1,254 primary schools and 208 secondary schools

were given a full inspection, including ICT grades, and these schools therefore form the basis of the current research.

# Appendix 3 - Statistical data and correlations

## A note on line graphs

In this report, where it is necessary to compare several different sets of figures in the same chart, the decision has been made to present this information in the form of a line graph, to facilitate clarity and comparison. However, this does not imply that the variables under consideration (OFSTED grades given for various features) represent continuous variation. For this reason, broken rather than continuous lines are used.

## A note on correlations

Correlation coefficients relating to every relationship described in this report are in a separate report, available on the Becta website. All correlations are statistically significant to at least 95% confidence, except those explicitly identified as not significant, by enclosure in brackets, for example (0.03).