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Evaluation

Evaluation of the ICT Test Bed project

**FINAL REPORT
JUNE 2007**

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1. Introduction

Purposes of the report

This is the final report of the Evaluation of the ICT Test Bed project. It provides key evidence for policy-makers on the impact of providing very high levels of ICT to schools and FE colleges on: teaching and learning; leadership and management; workforce development; cross-cluster relationships; and home and community links.

By its very nature, a Test Bed project is ambitious and exploratory. It asks the question: "How much can be achieved by this intervention?" The schools' and colleges' action plans focused on specific activities and tentative targets, but the outcomes of the project were necessarily unpredictable. Its aim was to see to what extent high levels of ICT resources could enable schools and colleges to change the life chances of children and young people in areas of relative socio-economic disadvantage.

The ICT Test Bed project

The ICT Test Bed project (2002-06) was initiated by the Department for Education and Skills (DfES) to explore how ICT can be used to support the Government's wider agenda for education reform. The project took a holistic approach to ICT implementation in three ICT Test Bed areas of relative socio-economic deprivation. A total of £34 million was invested over four years, which gave the 28 ICT Test Bed schools and three FE colleges access to very high levels of ICT hardware and appropriate software. The funding also provided for investment in staffing release and training support to make the most effective use of this investment. ICT Test Bed work focused on using ICT to:

- raise standards and performance, especially in the areas of school and college improvement, student attainment, and raising the quality of teaching and learning
- enable more effective leadership and management in schools and colleges
- help teachers to concentrate their time on their core task of teaching
- enable more effective collaboration between schools and their local colleges
- provide wider learning opportunities to students, their families and the wider community in a home environment.

All three ICT Test Bed local authorities have high concentrations of deprivation compared to the national average, though manifest in different ways (*see Technical Report 25: Cluster Contextual Data*).

The three school clusters had slightly different compositions. The Greater London cluster comprised three secondary schools, each with one of their junior and infant feeder schools. The inner-city cluster in the Midlands comprised a secondary school with seven of its feeder primary schools. The rural cluster in the North of England comprised a secondary school with nine of its feeder primary schools.

The management structures for the clusters were set up by the local authorities. The style and structures of management set up in the three clusters were very different, in each case suiting the local authority's established patterns of relationships with its schools.

It was important that the project was mounted quickly to provide ample time to recognise the consequences in teaching and learning, so procurement of equipment was rapid. All the schools invested in presentational equipment from the start and wireless networks were installed or upgraded. One critical decision was to employ technicians to support the infrastructure and both the local authorities and schools appointed a co-ordinator with significant release time to support colleagues.

Three kinds of evidence

The report is based on three strands of evaluation:

Quantitative data:

- Benchmarking of changes in performance on national tests against matched comparator schools and national averages.
- Modelling of e-maturity to track institutional change over four years.
- Annual surveys of teacher, pupil and parent attitudes and working practices.

Qualitative data:

Site visits including classroom observations, interviews with local authority managers, headteachers, teachers, administrative staff, technicians and students, and document analysis.

Action research data:

During the project, more than 90 teachers and para-professionals from the ICT Test Bed project institutions completed 116 action research studies of their innovative work with ICT.

The final summative evaluation reports of all three strands, together with a number of more detailed evaluation reports from the four years of the project listed in Appendix A, are available on the ICT Test Bed Evaluation website [www.evaluation.icctestbed.org.uk].

2. Key findings

Learning and teaching

As technology was embedded, schools' national test outcomes improved beyond expectations.

The impact of ICT on attainment levels was greater for primary schools than for secondary schools.

Effective use of presentation technologies led to greater interaction between teachers and learners.

Effective use of ICT personalised learning by enabling greater learner choice within the curriculum, improved assessment for learning and more learner-directed teaching.

Technology facilitated more effective assessment for learning by making it easier for learners to be more involved in target-setting and for teachers to give individualised feedback.

The use of electronic registration improved attendance levels in some schools by three to four per cent, while behaviour management systems were perceived to have a positive impact on both behaviour and attendance, prerequisites for effective learning.

To enable learners to get the maximum learning benefit from using the internet, internet protocols that safeguarded learners' welfare without being overly prohibitive were required.

Some changes to teaching and learning strategies were inhibited by tensions between the priorities of different government policies and agencies with regard to ICT.

Leadership and management

Institutions that were more e-mature improved their performance levels significantly more quickly than those which were not. However, there was a dip in performance until the ICT became embedded and staff developed the requisite skills.

Managing the implementation of large amounts of ICT required a strong vision, an extended planning phase, staged investment and support throughout.

Schools needed to build sustainability – of both resources and pedagogic change – into their change management strategies from the start.

Ready access to databases, which enable better analysis of data, made assessment and planning more systematic. However, there was a need to ensure that the amount of analysis required was not over-burdensome.

Management information systems (MIS) enabled leaders to better identify the particular needs of their school community through improved data analysis.

Workforce development

The involvement of ICT changed the working practices of teachers and extended the roles of administrative staff and technicians.

Well co-ordinated and sustained professional development opportunities were important in developing ICT skills and confidence of all staff and embedding the use of ICT. Informal, on-the-job training was very effective when supported by in-school champions.

Where new technologies were introduced into all of a school's classrooms at the same time, a culture of sharing and mutual support developed as the whole staff faced the task of embedding the technology into their pedagogy. Collective need led to collective solutions being found and shared.

Access to reliable technology and daily use led to rapid improvements in teachers' skills and improved management of workloads.

Shared server areas and virtual learning environments made it easier for teachers to find, store, share, create and reuse resources and lesson plans. This ensured long-term value from the initial high investment by the workforce.

Cross-institution links

Effective cross-institution collaboration required a common purpose and leadership from the top. Plenty of time for staff to meet and establish trust needed to be built into the process, with roles and responsibilities clearly identified. This was especially important in the cross-sectoral collaboration.

Home and community links

The majority of students in ICT Test Bed schools, as in other schools, now have access to computers at home. Loaning ICT equipment to learners helps to bridge the digital divide.

ICT made it much easier to share assessment information with parents via school websites or learning platforms.

Schools slowly increased their use of email – and, in some cases, text messages – to communicate with parents, enabling them to respond to parental enquiries more rapidly. However, establishing a two-way dialogue with parents was more challenging.

Increasing home access to ICT and the internet was operationally difficult for schools. It was very time-consuming and required careful planning.

3. Learning and teaching

Once technology was embedded, schools' and colleges' national test outcomes improved beyond expectation.

All graphs in this section show statistically significant differences in rates of change in performance.

At Key Stage 1

Whether a school was a Test Bed school or a matched comparator was not found to be a predictor of performance. Performance on the Key Stage 1 reading test shows growth at the national average, with all schools, including the Test Bed schools, performing significantly better for Key Stage 1 reading in 2006 in comparison to 2003. However, comparisons between the Test Bed and comparator schools revealed no significant differences for any of the tests, indicating that, at Key Stage 1, Test Bed and comparator schools were performing in a similar manner. Although not statistically significant, in 2006 both the Test Bed and comparator schools demonstrated a decline in performance from the start of the project – in line with the national trend – for the mathematics test and for average point scores (APS) per institution.

At Key Stage 2

At the start of the Test Bed project in 2002, the Test Bed primary schools were performing less well than matched comparator schools on a range of key performance measures: Key Stage 2 English, mathematics, science and the APS per institution. They were also underperforming compared to the national average on all of the four measures, with English and mathematics being of particular concern.

While collectively the Test Bed and comparator schools have shown improvements in English between 2002 and 2006, the rate of improvement for Test Bed schools was higher than for the comparator schools; indeed, the Test Bed schools outperformed the comparators in 2006 (Figure 1a). Of critical significance is the fact that the Test Bed schools are now at or above the national average (78 per cent) for English.

Key Stage 2 English 2002-2006

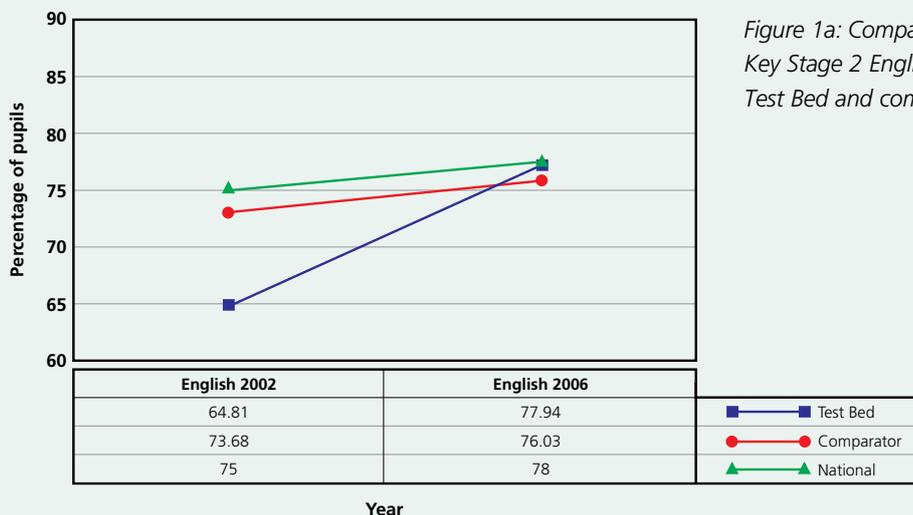


Figure 1a: Comparison of performance on Key Stage 2 English – national average, Test Bed and comparator schools 2002-06

Comparator schools made little or no progress in the Key Stage 2 mathematics tests or in overall APS per school over the four years of the project (Figures 1b and 1c). However, Test Bed schools did record improvements and these were particularly strong in mathematics. On both Key Stage 2 and APS scores, the Test Bed schools turned from being underperforming schools to matching or bettering the national average (mathematics national average 2006: 76 per cent; APS: 27.5).

Key Stage 2 Mathematics 2002-2006

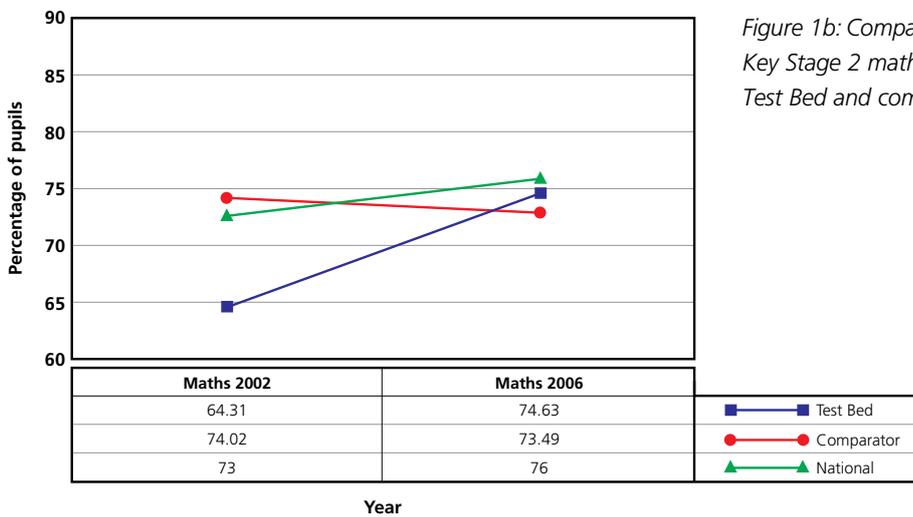


Figure 1b: Comparison of performance on Key Stage 2 mathematics – national average, Test Bed and comparator schools 2002-06

Key Stage 2 Average Point Score 2002-2006

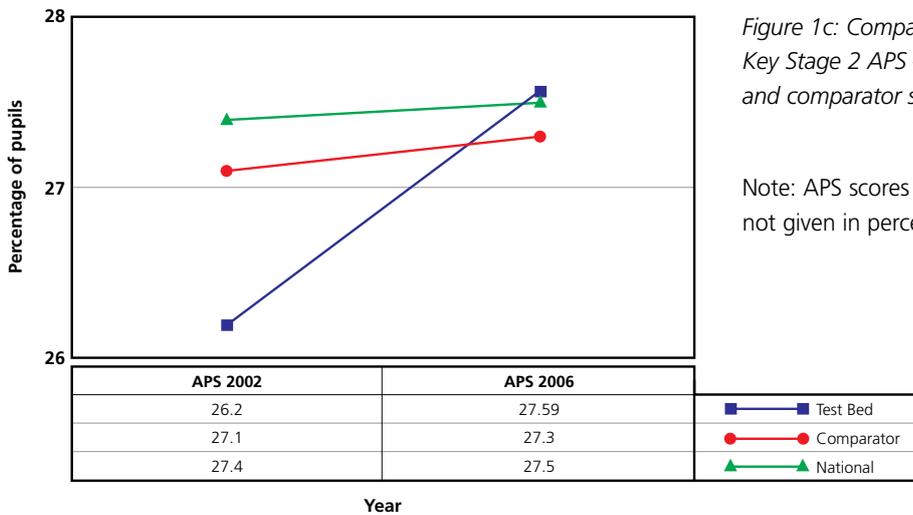


Figure 1c: Comparison of performance on Key Stage 2 APS – national average, Test Bed and comparator schools 2002-06

Note: APS scores are, by definition, not given in percentages

The final Key Stage 2 measure investigated was that of science. Nationally, there was a one per cent decline in science scores between 2002 and 2006. The comparator schools also showed a decline in performance but this was more pronounced than the national figures.

The Test Bed schools, on the other hand, showed improved performance in science over the lifetime of the project; from a very poor base, they are now performing at the 2006 national average of 85 per cent (Figure 1d).

Key Stage 2 Science 2002-2006

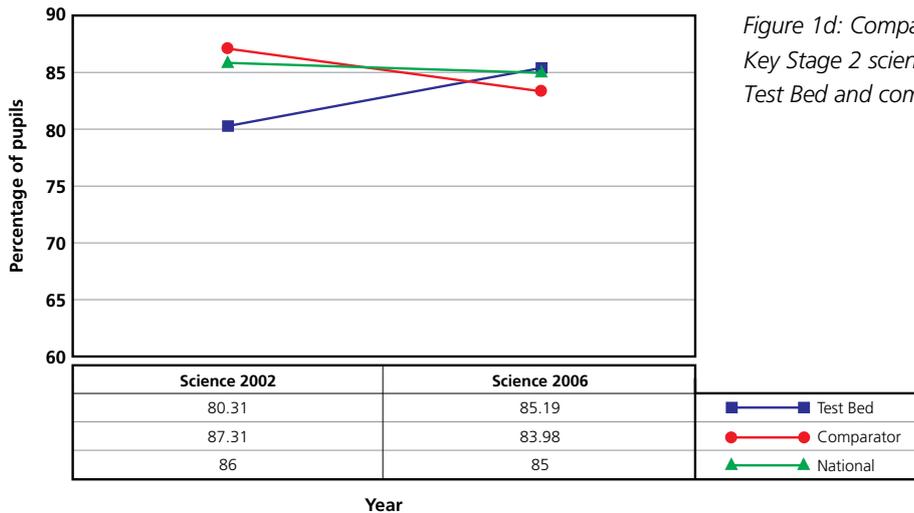


Figure 1d: Comparison of performance on Key Stage 2 science – national average, Test Bed and comparator schools 2002-06

In summary, at Key Stage 2 there is clear evidence of differential performance gains by the Test Bed schools compared to comparator schools. As the project reaches its conclusion, the Test Bed schools are now performing at or above the national average.

In two schools which were the focus of a particular qualitative study, the Key Stage 2 boys have been much more highly motivated to take pride in their writing and expend effort on it than when they worked solely with books. As a result, boys’ achievement levels in writing have greatly improved: in 2006, five boys out of nine exceeded expectations and the contextual value added (CVA) score for boys was 100.0, compared with 99.1 in 2004 and 99.3 in 2005. CVA scores for girls over the same period were 100.2 in 2004, 100.4 in 2005 and 100.5 in 2006, so the rate of improvement for boys was greater than for girls – an extremely important gain in relation to national trends.

At Key Stage 3

In contrast to the Key Stage 2 data, no significant differences were found at Key Stage 3 between the performance of the Test Bed and comparator schools for any year of the project. Performance at Key Stage 3 was not mediated by school involvement in the Test Bed project.

At GCSE

Both the Test Bed and comparator schools made significant gains in APS between 2003 and 2005, but there was a plateauing of achievement in Year Four. There was no difference between the Test Bed and comparator schools on rate of change in APS scores between 2002 and 2006.

In 2006, there were differences highlighted between Test Bed and comparator schools for the proportion of students achieving five or more A*-C grades (including English and mathematics). Significantly more Test Bed pupils (mean = 38.80 per cent) achieved five or more A*-C grades (including English and mathematics) in Test Bed schools than in comparator schools (Figure 2a). Given that this is a new measure of attainment introduced in 2006, it is interesting to note that the Test Bed schools are performing well on the traditional subjects as well as on the newer applied subjects.

GCSE Grades A*-C (including English and mathematics) 2006

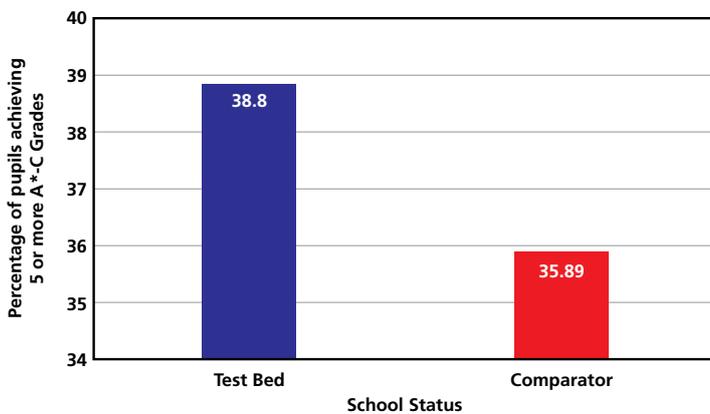


Figure 2a: Comparison of proportion of GCSE students gaining five or more A*-C grades (including English and mathematics) 2006

Differences between the Test Bed and comparator schools were also found for the number of students achieving five or more A*-G grades, with comparator schools scoring significantly higher in 2006 than Test Bed schools (mean = 87 per cent Test Bed and 92 per cent comparator) (Figure 2b).

GCSE Grades A*-G 2002-2006

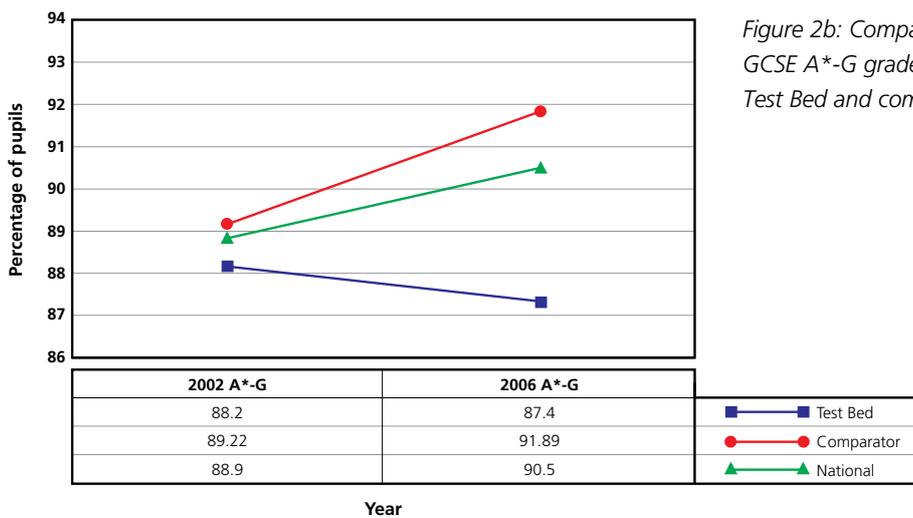


Figure 2b: Comparison of performance on GCSE A*-G grades – national average, Test Bed and comparator schools 2002-06

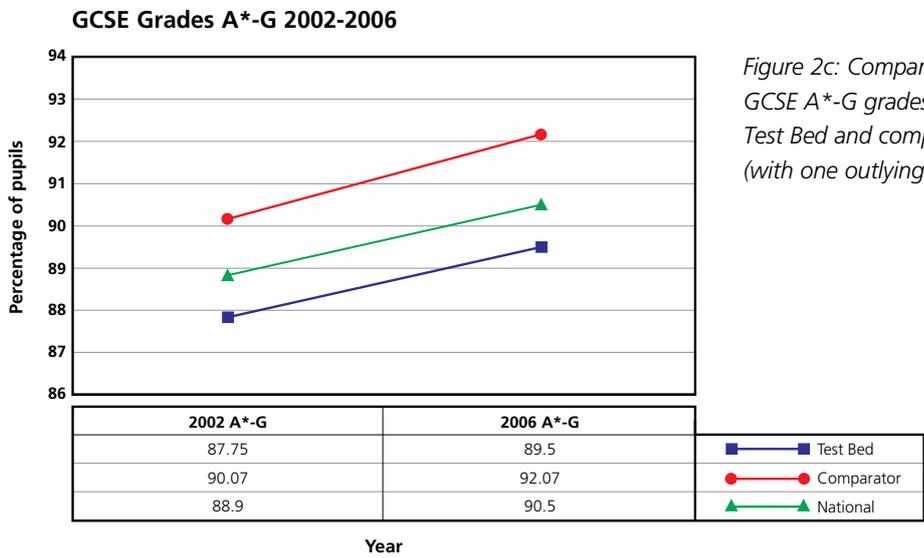


Figure 2c: Comparison of performance on GCSE A*-G grades – national average, Test Bed and comparator schools 2002-06 (with one outlying school removed)

It should be noted that in 2006 the pattern of results across ICT Test Bed and comparator schools is very similar, except for one ICT Test Bed school which shows a decline in performance having had significant changes in management during the project. As the ICT Test Bed sample contains only five schools, in contrast to a sample of 20 comparator schools, such a school will have a significant impact on the collective data, skewing the distribution and means as is the case here. Figure 2c shows the same A*-G data as Figure 2b, with the one outlying school removed, indicating that, without this school, the performance of Test Bed schools was improving at or above the national average, as was the performance of the comparator schools.

At post-16

No comparisons of rate of change were possible as the DfES altered the way the scores are calculated in 2006. However, the data suggests little change for APS per student or APS per examination entry for either group over the four years of the project. In 2006, using the new metric, APS per student is higher for comparator than Test Bed students but the APS per exam entry did not differ. This mean that students in Test Bed schools were achieving the same APS per exam as students in comparator schools, although the latter were studying a greater number of A-levels.

The impact of ICT on attainment levels was greater for primary schools than secondary schools.

Although differential progress across the three sectors (primary, secondary and FE) was difficult to assess given the disparity in sample size, the data on attainment suggests greater gains at Key Stage 2 than at GCSE level. The evaluation noted that in primary schools, although there is a well-defined curriculum, there was more scope for managing this curriculum in relation to ICT because of the flexible timetabling and planning which derives from having one teacher and one class. Integrated project work across the curriculum was a real possibility, involving more writing through the medium of ICT with its constant grammar and spelling checks and more readily available redrafting procedures.

The traditional timetable and room-changing structure in secondary schools inhibits the use of ICT. This is exacerbated by the curriculum in secondary schools, which is largely determined by external authorities, examination boards and central strategy creators. The impact of technology on these matters is reduced by the need for national regulatory frameworks and procedures to cater for schools in which the technology is limited. Some secondary schools have tentatively experimented with different timetable structures or suspending timetables for short periods of time, but the changes have generally not been consistent or sustained.

Project work, whether integrated or within a single subject, is greatly enhanced by the use of ICT and gives students a greater element of choice. While it is common in Key Stage 2 and evident in some Key Stage 4 subjects, it is much less utilised in Key Stage 3 where subject integration is rare and study periods tend to be short. Current proposals to reduce the amount of course work in Key Stage 4 are likely have a negative impact on the significant use of ICT at this stage.

Effective use of presentation technologies leads to greater interaction between teachers and learners.

Presentation technologies were introduced in all ICT Test Bed classrooms. These included interactive whiteboards, visualisers and graphics tablets (used in conjunction with computers and data projection onto large screens). The presentation technologies had a positive impact on classroom practices and learner experiences owing to their visual nature, structure, clarity, instant feedback, immediacy, relevance, pupil engagement and involvement, and pace. They not only provide a wider variety of stimuli but present a text which is easy to change (by student suggestion or by varying explorative data in a graph) and annotate (by highlighting parts of speech, for instance).

The presentation of learner-created content is immediate, and easily saved for later use.

'Drag and drop' allows young pupils to create their own organisation of objects for number activities.

Data for creating graphs can be changed and the effects explored.

In primary classrooms, the technology is also used to rerun group discussion to the whole class, encouraging peer comment.

Microscope images can be presented to the whole class, enabling all to engage in analysis of the objects.

For many secondary teachers, the presentation technologies did indeed change their practice from a didactic approach to a more interactional one asking more questions and more able to focus on learners' knowledge. This stopped short of passing control to the pupil but did increase pupil involvement and pupil impact on the lesson. For some secondary teachers, presentational technologies essentially provide a more efficient method of presenting notes and apparent practice changed little, and while this did not make full use of the resource, it was nevertheless still beneficial for the learners.

Effective use of ICT personalised learning by enabling greater learner choice within the curriculum, improved assessment for learning and more learner-directed teaching.

In maturity modelling analysis of the Key Stage 2 and GCSE data only, schools showing greater maturity in promoting personalisation (through regular and frequent use of ICT by staff and students) also did well on key predictors of institutional performance. Furthermore, analyses conducted to investigate the development of this kind of personalised, ICT-rich learning found that, at secondary and FE level, it correlated strongly with good physical resources, human resources and skills, indicating the embedded nature of this pedagogy which the ICT Test Bed schools were rapidly developing.

Schools used ICT to provide pupils:

- with opportunities to follow their current interests or needs within the boundaries of the necessary curriculum and to provide scope for more in-depth learning activities
- with a sense of control, involvement and choice in their learning, and ICT also helped to provide the learners with some awareness of personal cognitive understanding
- with a clear sense of their achievements and an involvement in making and reaching targets through access to their assessment profile and its meaning.

Where they have been established, the learning platforms offer potential for learners being involved in choosing more of their learning paths, but this has yet to be fully realised in schools.

The use of the display technologies enabled pupils to visualise material that would be more difficult to access in traditional formats. Many staff focused on the development of truly interactive resources for the interactive whiteboards rather than simply presenting text. Visualisers provided a valuable means of creating a communal focus for the analysis of students' work. The use of digital still and video cameras was particularly extensive in the early years. They served to bring images of pupils' homes into the classroom. They were also considered useful for recording pupils' work for assessment purposes and demonstrating their achievements; they also provided evidence which could be transmitted should a child change school.

Pupils with special educational needs (SEN) were recorded on video giving explanations of problematic concepts, and these were used with other pupils and played back for the SEN pupils to self-assess and improve.

Technology enables English for speakers of other languages (ESOL) and SEN learners to have greater access to the curriculum.

Videoring role-play in reception helps the teacher to analyse the pupils' behaviour, and can help the pupils themselves to learn to review what they have done, enabling them to study how they spoke and acted. This encouraged a high degree of self-criticism and self-learning as well as giving them experience of how to deal with peer comment.

Video recording of rehearsals for school plays enabled the actors to see themselves and improve their performance.

A pupil with behavioural difficulties was provided with a digital video reference by her classmates when she changed schools.

Foundation stage teachers were able to video a record of children's activity as confirmation of their baseline assessments.

Incorporating the teacher's voice in animations or pupil photographs on websites made visual resources more personal.

Young children took digital cameras home and brought pictures back for discussion, enhancing the sense of home-school collaboration.

Students could video their work as a record of their achievements.

Providing clips of student work enabled teachers to agree on assessment criteria, and enabled students to understand them.

Digital videos of geography field trips allows for later analysis by individual students, even those who had missed the trip.

Digital video was also used to prepare students and parents for school trips.

One area in which pupils can gain a measure of control over their work programme is where they are engaged in project work. Learners often created presentations, developing research skills as well as ICT and verbal presentational skills. ICT enabled pupils to have greater choices about how to present their work and what learning activities to undertake. For example, as well as using word-processing and presentation software, they were easily able to publish their ideas using animation, short films and photography.

In addition to its impact on plenary sessions starting and ending lessons, group and individual work was also supported by the availability of computers in a number of ways. The use of individual skill training programmes on a group rotational basis provided regular re-enforcement. The variation in information available from the internet allows for more student selection of materials, for example, when working on biographies they can choose their own subject. The use of 'track changes' facilities on word-processing programs allowed the teacher to correct and comment on students' writing and provide a clear outline of the drafting process. The preparation of group presentations gives purpose to project work and increases self-esteem in the production of shared exhibits.

Technology facilitates more effective assessment for learning by making it easier for learners to be more involved in target-setting and for teachers to give individualised feedback.

The ease with which targets can be displayed, responded to and then saved led to more use of target-setting at the beginning of lessons and to following this through coherently in subsequent lessons. Linking exemplar student responses into planning aided consistency in assessment by the teachers by establishing agreed criteria for success. It also provided scaffolding for students responding to tasks by helping them to assess what was required and to recognise what a good answer looked like. By focusing on the learners' outputs, the assessment activity was immediately made personal and relevant.

The 'track changes' facility in word processors was used by teachers for commenting on individual learners' work and then for learners to make improvements. The software automatically used different colours for each, providing a clear record of the whole process of learners' writing, teachers' comments and learners' revisions.

In secondary schools, new assessment programmes enabled teachers to build a set of targets against which students could record their achievements and indicate the evidence for this. This was done at any time in or out of class. Targets were reviewed by the teacher and comments added, providing each student with an ongoing assessment against the year's targets.

The use of electronic registration improved attendance levels in some schools by three to four per cent, while behaviour management systems were perceived to have a positive impact on both behaviour and attendance, prerequisites for effective learning.

The ready access to assessment and attendance information and behavioural records was particularly invaluable to those engaged in managing pastoral support. ICT enabled student attendance and subject avoidance to be monitored more carefully, leading to improved attendance and punctuality, which were perceived to be positive consequences of electronic registration.

In primary schools, electronic registration enabled rapid contact with parents in the case of unauthorised absence, leading to better safeguarding of children and some schools reported an increase in attendance of three to four per cent.

In secondary schools, the use of lesson-by-lesson registration helped to track student attendance and identify 'subject avoidance' more carefully.

Behaviour management systems ensured that the same information is readily available to all pastoral managers, although clear protocols are required if the appropriate data is to be gathered at the time of the event. It enabled a more consistent approach to rewards and punishments, and enabled managers to recognise more readily persistent misbehaviour or growing trends in the patterns of behaviour. Action to obtain parental support could be taken quickly since the evidence was clearly presented to parents. Students also recognised that their absences were acted upon earlier by the relevant managers, and in a more consistent way, which informed them of what to expect.

To enable learners to obtain the maximum learning benefit from using the internet, internet protocols that safeguard learners' welfare without being overly prohibitive are required.

Proper safeguards against viruses, unwanted emails and pop-ups are essential for schools. There were, however, some problems arising from overzealous blocking of sites, thereby inhibiting access to useful learning provision, a feature also found by Underwood et al (2004). Policy action is needed to provide schools with safeguards against the perceived risks of litigation and advice to help them avoid developing a risk-averse culture of internet use.

The internet gives teachers access to information so much more quickly and easily that finding lesson content is no longer a problem; the main focus is now on the presentation and organisation of the information. For learners, the ability to 'free range' the resources they want from the internet provides a wider source than classroom reference texts. Researching material for projects on the internet is one of the major uses of ICT by students.

Some changes to teaching and learning strategies were inhibited by tensions between the priorities of different government policies and agencies with regard to ICT.

Teachers' concerns about some Ofsted inspection comments prompted the evaluators to examine inspection reports on 11 ICT Test Bed schools during 2005-06, and to carry out detailed analysis of the reports on two schools which had achieved remarkable gains in attainment in writing at Key Stage 2 through the use of ICT.

There was a pattern of inspectors disregarding the use of ICT as an integral part of learning across the curriculum and, in some cases, not accepting evidence presented through ICT. Clearly, in ICT-rich schools ICT is no longer 'merely' a curriculum subject but a vehicle for learning across the whole curriculum and this needs to be built into inspection criteria.

The DfES National Strategies were not seen by teachers or curriculum co-ordinators as being in the forefront of ICT development in their respective subjects. This is almost certainly because national policies and regulatory structures need to cater for the schools without a strong ICT base. This led, of course, to teachers augmenting suggested strategies to take full advantage of the ICT resources for supporting learning. The recent involvement of the strategy teams in leading the Primary Schools Whiteboard Expansion Project is a move towards rectifying this.

This sense of national programmes not making full use of ICT was strengthened by the nature of standard tests in avoiding assessing learning through the use of ICT. Assessment practices, particularly the requirement to complete all examinations in handwriting, are not aligned with schools' increasing use of ICT for students' writing, despite the clear benefits of writing on a computer in improving spelling and composition skills and motivating underachieving boys to engage in writing with enthusiasm.

4. Leadership and management

Institutions that were more e-mature improved their performance levels significantly more quickly than those which were not. However, there was a dip in performance until the ICT became embedded and staff developed their ICT skills.

Institutional maturity was modelled over the four years of the project in six areas: technology; curriculum; workforce; leadership and management; inter/intra-institutional linkage; and external linkage (for example, with homes and employers).

In 2002, low levels of maturity were widespread, but not universally, across ICT Test Bed primary and secondary schools and FE colleges. In particular, maturity in terms of using ICT for linking within and between cluster institutions and with external bodies was found to be weak, compared to comparative strength in all matters related to curriculum development. However, over the first two years of the project, a sharp rise in overall maturity was evident as the institutions embedded the new technologies into their institutional practices.

By the end of the project, the Test Bed institutions were collectively performing at the highest levels of maturity in relation to technology (Model 1) and workforce development (Model 4). The former was anticipated as the Test Bed project injected significant technological resources into the institutions, as was the latter because the institutions could see an immediate need to respond to the changing infrastructure (see Figure 3).

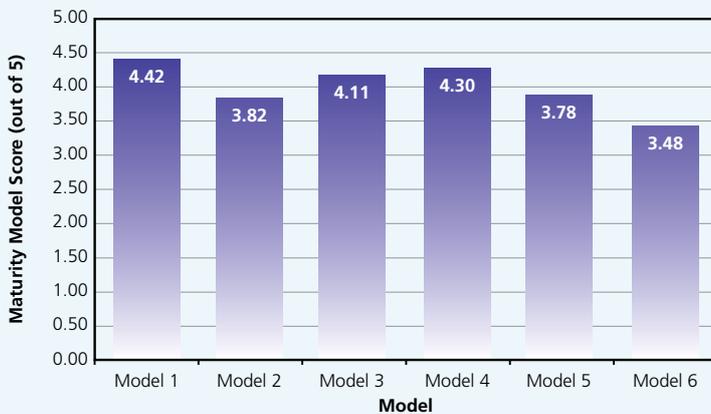


Figure 3: A comparison of scores on each of the six maturity models in the final project year, 2006 (all sectors)

In 2004-05 and 2005-06, there was evidence generally of a reduced rate of overall change across all three sectors, a characteristic of all maturing systems (see Figure 4).

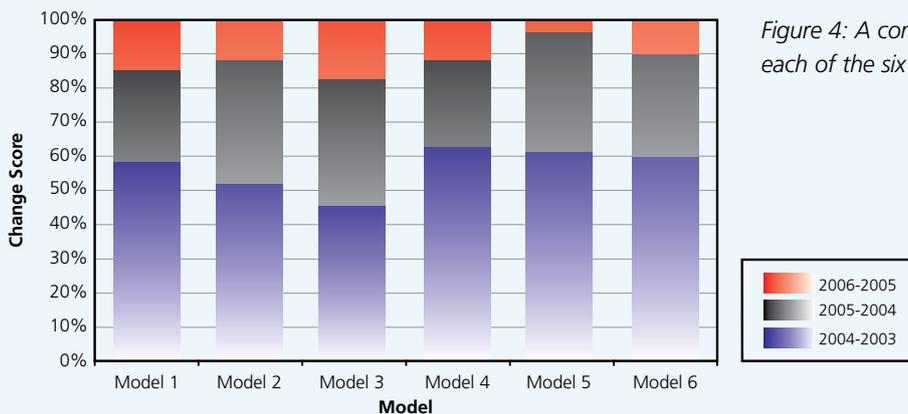


Figure 4: A comparison of change over time for each of the six maturity models (all sectors)

Institutional maturity was lowest in the areas of linkage (Models 5 and 6), and this pattern was evident throughout the four years of the project. This appears to be because these were areas which inevitably involved a great change in each institution's modus operandi but without an immediate 'need' being identified.

The development of ICT confidence and competence across the majority of the staff within each of the Test Bed schools, as well as within defined sectors of the colleges, enabled staff (teachers and para-professionals) to make a shift in their support of learners. Thus, technology has been embedded into practice. Teachers have developed their range of pedagogic strategies, assistants have become information providers, and the administration of the institutions has achieved new efficiencies.

The educational community has long understood that such developments come with an initial cost: a short-term innovation dip. What is new here is that the post-dip recovery has been unequivocally confirmed by the quantitative analyses over a four-year period.

Two key findings indicate the existence of an innovation dip. The first finding was that the link between levels of school maturity and key performance indicators ceased to exist in the second year of the project. This link had been present in the first year and was recovered in the third and fourth years of the project. The second finding related to Test Bed school performance at GCSE level. Until the fourth year of the project, Test Bed schools in the secondary sector were found to be underperforming in relation to their matched comparators. However, by 2006 (the final year of the project), the Test Bed schools had narrowed the gap, providing support for the notion of a 'recovery' period.

The ICT Test Bed project has enabled institutions to develop and mature. Being part of the project has presented challenges to all aspects of core institutional business. As the institutions have developed and refined their understanding and embedding of the technology, they have become more efficient and better able to track student progress; this has linked into the development of different pedagogies and a greater personalisation of learning.

Increased e-maturity had a significant impact on each institution's performance: maturing systems and improved school performance go hand in hand. The e-maturity of each of the six submodels improved at different rates, within and between different institutions. The relationships between them are very complex. The current models show that levels of leadership and management and curriculum maturity are key predictors of institutional performance. The institutional curriculum ICT policy, in particular, was found to be a key factor in predicting performance on national tests. The importance of technical support within the workforce model on performance outcomes was also of interest, and supports schools' suggestions that technical support is vital.

Managing the implementation of large amounts of ICT requires a strong vision, an extended planning phase, staged investment and support throughout.

It takes time for senior management to absorb the import of large-scale changes implied by ICT, so an extended planning phase is needed for major projects. The project needs to be built into the school improvement plan. Because all major projects are 'test bed' innovations, there must be some delayed investment to allow for rethinking parts of the strategy. Lack of experience in making procurement decisions, coupled with immaturity of hardware and systems development, led to some early difficulties with wireless networks, MIS and learning platforms.

A vision of what is possible is essential for leadership of change, especially if the change involves large-scale investment in ICT. Senior managers need opportunities to see examples of similar work early on and the planning phase should not be rushed.

The commitment of the whole senior management team was found to be essential and those schools and colleges (the majority) with well-established, stable management achieved much more than others from high expenditure on ICT.

The initial implementation strategy should encompass a review of management structures and change agency processes as well as resources. Release time for leadership support is needed early in the project but can be reduced as the project becomes embedded. Similarly, demand for technical support is high early in initiating ICT and while it needs to be sustained later in the development of ICT capability, it can be at a lower level.

In those clusters where there was a tradition of strong leadership from the local authority, the in-school management load was considerably reduced. Some local authorities were able to provide expert assistance in procurement to the great benefit of schools. When initiatives of this kind are self-managed by a school consortium, it requires considerable investment of headteacher time.

Schools needed to build sustainability, of both resources and pedagogic change, into their change management strategies from the start.

Sustainability needs to be built into the strategy from the start and not considered only at the end. Real sustainability means the long-term embedding of ICT in pedagogic change. ICT equipment is now an essential priority in all the institutions' budgets and many initial anxieties regarding continued investment after the end of the project were not substantiated. This was the result of both the reducing costs of ICT equipment and the continuity of policy with new funding initiatives, such as computers for pupils, coming on stream.

Ready access to databases – enabling better analysis of data – made assessment and planning more systematic. However, there was a need to ensure that the amount of analysis required was not over-burdensome.

ICT made planning much more transparent, more public and more easily shared and monitored. This had a positive impact on consistency and curriculum monitoring, and was particularly appreciated by headteachers and heads of department. The analysis of assessment information by the school or department improved significantly, providing increased coherence and consistency. Sometimes, this led to a demand for more assessments to improve the analysis and placed more pressure on teachers.

ICT made a considerable difference by making assessment information readily available to individual teachers and enabling them to share this information with other teachers.

Assessment information for parents was much more readily available, especially where a learning platform had been established, but this is still not the norm in schools and is not generally utilised by parents.

In all schools, but particularly in primary schools, skills in analysing assessment data have been enhanced by the provision of useful information from the DfES and local authorities, which is generally well used by schools to support their standards. The ease of transmitting and gathering data enabled by ICT has led to an increased flow of this data to and from the DfES and local authority, though headteachers feel that the volume of data provided needs careful monitoring to prevent overload.

Management information systems (MIS) enable leaders to better identify the particular needs of their school community through improved data analysis.

MIS installed, upgraded and developed during the project were well able to support a more analytical and responsive approach to management in secondary schools and some larger primary schools. They provided ready access to information which was consistent for all managers, and this encourages better analysis and consequent action. In small primary schools, only some elements of the system were found to be helpful: those concerned with record-keeping, registration and storage and analysis of pupil data. There was only limited use of behaviour management systems and assessment packages. Primary schools were achieving many of the facilities of an MIS through a well-structured file storage system on the server and networked connections in all classrooms.

5. Workforce development

The involvement of ICT changes the working practices of teachers and extends the roles of administrative staff and technicians.

The annual surveys have shown year-on-year growth in ICT competence and confidence for staff, students and parents at all levels, demonstrating that those sampled are now very much part of the e-society that pervades life today. The growing e-maturity of the workforce manifested itself not only in the increasing level of skills of the more advanced staff, but also in the widening of participation in developing and using ICT resources across the whole staff within the project institutions.

ICT enables teachers to use new, more efficient methods of locating and creating resources. They can search, create and adapt materials using a much wider range of sources than previously to form new learning activities. The initial making or researching of classroom resources is hard work for teachers, but the ease of storage and retrieval is making a major impact on future lesson preparation.

Resources which supported teachers in creating their own materials (providing clip art and video clips as well as construction tools) were deemed valuable by primary teachers, whereas secondary teachers used generic word-processing, presentational and spreadsheet programs.

ICT creates a new and increased culture of sharing of materials and resources between teachers, through shared server areas or online learning environments at all schools levels. In primary schools, sharing of resources happens within year groups and in secondary schools within departments.

The use of presentation technologies (data projectors and ancillary equipment such as interactive whiteboards and visualisers) led to rapid development of teachers' ICT skills, and a more interactive style of teaching. The value which arises from preparation of slides and lesson images fits closely with what teachers like to do and encourages them to plan their lessons in greater detail. In doing this, their computer skills were implicitly increased and ICT became an embedded natural part of their classroom.

When the planning and presentation is accomplished in advance, the teacher can concentrate in the lesson on the pupils and their responses, creating an easier forum for discussion and interaction with the pupils. The ease of adapting, adding and saving interactive whiteboard pages leads to more teacher-student interaction in developing conceptual statements and greater coherence and consistency in these descriptors over time.

The training of teaching assistants gave them an improved status and confidence in the classroom and this was invaluable in developing ICT use and resources. Teaching assistants also helped ensure continuity when supply teachers were needed since they were familiar with the systems and resources to be used in class. In some project schools, teaching assistants developed specific skills such as animation and video editing to support teachers and students.

Teaching assistants support individual pupils and groups in working on computers in their classrooms, and they support teachers, especially at the foundation stage, in conducting assessment tasks.

Technicians had enhanced roles and were vital for the school or college to maintain its high level of use of ICT. As the ICT investment developed, so technicians had to develop further skills and knowledge. Their need for training was not always recognised and like the administrative staff this needs co-ordination and support by the local authorities.

Improved MIS systems and administrative processes made administrative roles more demanding but produced significant gains in the availability, use and accuracy of data at all levels of the organisation. They often led to closer co-operation between teaching and administrative staff in securing and maintaining the data. These staff needed training, not just when new systems were implemented but to enrich their existing skills. This was found to be best co-ordinated by the local authority so as to provide for staff who are often isolated in their own schools.

In primary schools, MIS have revolutionised the role and skills required for school secretaries, providing greatly enhanced status and involvement in the educational process.

From fairly low levels of ICT resource at home in the first year of the project, by 2006 the majority of teaching and support staff could access ICT at home and at school.

Well co-ordinated and sustained professional development opportunities were important in developing ICT skills and confidence of all staff and embedding the use of ICT. Informal, on-the-job training is very effective when supported by in-school champions.

Training needed to be co-ordinated with the introduction of the equipment so that staff were able to practise their newly learned skills. It needed to be timetabled carefully so that participants do not feel overwhelmed. Poor initial training can lead to staff not taking up the new resource and recovery of the initiative is difficult and time-consuming. Training also needs to continue after the initial phase in order to ensure that new learning can take place and so that 'bad habits' can be addressed.

The local authorities and Becta offered training and carried out an analysis of staff skills which was used to develop a programme of continuing professional development (CPD) matched to skills requirements. The change management tools, developed by the National Remodelling Team in 2003 to support workforce reform agenda, were very helpful [<http://www.tda.gov.uk/remodelling/managingchange/tools.aspx>]. Some providers of resources and equipment have provided excellent support and managers should explore with suppliers the support offered before committing to a new resource. Central systems – such as MIS and learning platforms, in particular – needed good training packages.

For primary schools, a progressive programme of training for representative teachers from the schools was cascaded back into the schools very effectively. Most schools had members of staff who had become accomplished with certain pieces of equipment, and then supported and sustained activity undertaken with that equipment by their colleagues. The key was the corporate and co-ordinated approach taken between and within the schools.

One school followed a planned four-week cycle:

Week one involved a model lesson and demonstrating a piece of equipment.

Week two involved team teaching.

Week three was spent using the equipment and experimenting.

Week four was an assessment of how and when to use the equipment.

Primary ICT co-ordinators also played a major role in raising skills levels within schools using their increased non-teaching time to work with colleagues in order to develop their use of the technology. External trainers were used for specific events and the FE colleges in the clusters offered a range of training opportunities to school staff.

Secondary schools also brought in external trainers for specific subjects. Change management training organised by the local authority was valuable in helping to implement the project. As the project progressed, secondary schools drew more on their own resources for staff CPD, using the specialist IT and other teachers, technicians and content developers to deliver specific training. Advanced skills teachers (ASTs) played an important role in designing and delivering this training. ASTs who have been trained in coaching skills have then coached colleagues within the department and sometimes within the wider school.

The most effective training was often informal, involving teamwork and mutual support. Training became more effective when staff could see what colleagues were doing, take part in more informal team learning and practise with the equipment on their own. The development of 'champions' with expertise in particular equipment was valuable – both in primary schools and within secondary departments – in providing support at the point of need. This was particularly effective when the role of 'champion' was spread among colleagues and not focused on a single school/department expert.

I've learned more from *** or from *** about little tips of shortcutting. I think it's time we started looking at what we've got in the school and using it. (Secondary schoolteacher)

We hold weekly training sessions... the staff team get together in small clusters and train each other, show each other techniques and ideas. They are not told 'do it'; they do it as they're professionals. (Secondary head of ICT)

Action research supported professional development and pedagogical change. It was valued highly by the staff in primary schools and in FE colleges who took part. The participation by secondary teachers was very low, reflecting the general lack of priority for generic CPD by secondary teachers, for whom subject-focused development is central.

Introducing new technologies into all classrooms at the same time created a culture of sharing and mutual support, as the staff as a whole faced the challenge of embedding the technology into their pedagogy.

Installation of ICT equipment in all classrooms at the same time proved to be one of the best ways of getting staff to form a mutual support group and learn together, as collective need led to collective solutions being found and shared. In the long term, this had a profound positive effect on embedding pedagogic change. This was true in all the ICT Test Bed primary schools, in some secondary school departments and in the selected curriculum areas in the three colleges. The key lesson here is that embedding change in pedagogic practice is more likely to occur if there is a combined focus by all staff on using new ICT equipment and software, rather than a gradual introduction over time.

Access to reliable technology and its use on a daily basis led to rapid improvements in teachers' skills and improved management of workloads.

Daily use of presentation technologies led to rapid gains in teachers' ICT skills. Interactive whiteboards and visualisers with data projectors were easily the innovations most readily welcomed by the teachers and the one to which they were most committed.

Personal access to PCs or laptops had a major impact on teachers' roles and that of the support staff, giving flexibility and choice with regard to the location of work. One consequence of the increased skills developed by teachers and support staff was that they felt more confident in dealing with technical hitches and failures.

Shared server areas and virtual learning environments made it easier for teachers to find, store, share, create and reuse resources and lesson plans. This ensured long-term value from the initial high investment by the workforce.

Teachers have always shared ideas and activities, but the ease of access and immediate availability of other teachers' resources made a significant difference in the corporate planning and development of teaching resources. It also brought with it new tasks for organising and maintaining resources.

There was a need to do assembly on Monday and two minutes later whack together a quick presentation. That was with the lower school. Walking in on Wednesday, I saw my presentation up on the screen being used by the teachers in the upper school, adapted to meet their needs. I thought that this is fantastic.
(Primary deputy headteacher)

ICT created a new and increased culture of sharing of materials and resources through shared server areas or online learning environments at all schools levels. The establishment of shared network access was a major instigator for such staff activity in sharing resources and ideas. The common availability of these resources and planning made it easier to incorporate and support supply teachers and to induct new teachers into the school ethos. It also provided greater consistency for the learners.

Some schools joined with others in their cluster to create resources and others were supported by experienced 'content teams' from the local FE college or the partner secondary school.

Content creation teams and resources developed by groups of teachers were found to be helpful but they were generally used as a stimulus for ideas rather than as presented. Animations and small flash programs created by the content creation teams were particularly useful, but they should be developed closely with teachers so as to provide a source of expertise enabling teaching staff to become more skilled. 'Ownership' of resources – that is, teachers having a close understanding of, and sympathy with, what the program contains and is trying to achieve – is a critical issue for teachers and hence content development needs to be tailored for individual and local needs.

Establishment of virtual learning environments did not get fully underway until the third year of the project, when they had become fit for purpose. This was frequently a learning experience for schools and developers alike. Where virtual learning environments have been initiated, there is evidence of secondary school students having growing access to them, though at the moment only a small number of parents access these resources with any regularity.

The development of the learning platform in one of the ICT Test Bed clusters has been trailblazing. It was not simply a matter of identifying technical solutions but also a matter of major cultural change, and it is not surprising that the learning platform is still at a relatively early stage of development at the end of the ICT Test Bed funded period. The use of the learning platform was due to the hard work and commitment of staff and senior managers, and has been achieved through the careful choice of initial innovation topics presenting 'quick wins' for teachers and other users. Email and communication gains were an early development, (see the focused study: *A Case Study of the Learning Platform(s) in One Cluster*).

6. Cross-institution links

Effective cross-institution collaboration required a common purpose and leadership from the top. Plenty of time for staff to meet and establish trust needed to be built into the process with roles and responsibilities clearly identified. This was especially important in the cross-sectoral collaboration.

Part of the project's vision was that schools within the cluster and the local FE college would increasingly use ICT to strengthen opportunities for collaboration, importantly across the 14-19 age group but also enabling the different skills and knowledge within each institution to be shared for mutual benefit. This proved to be the aspect of the project's work that was least developed, though some new links and support mechanisms were initiated. This was almost certainly due to it being accorded lower priority than other aspects of the project.

Cross-sector collaboration required a clear purpose, proper management and for roles and responsibilities to be clearly identified. Where the collaboration was between FE colleges and schools which are under different governance, this was particularly important. Additional challenges included geographical barriers and tensions between the benefits to be gained from pooling knowledge and expertise, and the need for local control and ownership. Cross-institution collaboration initially required plenty of time for consultation, to establish new relationships and trust. Effective and open communication between all those concerned was a key success factor. The close involvement of headteachers appears to be an essential prerequisite for good inter-school collaboration.

Inter-school collaboration is easier when the group itself has a clear identity, either geographically or through strong cluster arrangements, and where schools have more than one issue in common. In one cluster, the primary schools were already used to working together and close collaboration became a major means of providing mutual support and extending development work.

The embedding of email as a central communication tool has facilitated cross-institution collaboration, providing instant communication without demanding instant response and has led to increased exchanges of professional ideas between headteachers and teachers.

In addition to content production workshops, FE colleges have provided support for parent ICT training in some schools, and have supported schools with specific skills such as animation techniques.

Inter-institution support through video conferences was tried by a number of schools and colleges, and although there were occasional stories of benefits, it has largely not been successful overall. This was largely due to technical incompatibilities, but it was also apparent that video conferencing needs a clear purpose and careful pre-planning to be useful. This often looked like a technology looking for a purpose.

7. Home and community links

The majority of students in ICT Test Bed schools, as in other schools, now have access to computers at home. Loaning ICT equipment to learners helps to bridge the digital divide.

More than 90 per cent of students in project institutions now have access to ICT at home, while some report using local or school libraries for access. However, there is still a core of nearly 10 per cent of students who report having only limited access at school and no access at home. Those without facilities were highlighted as becoming more, and not less, of a concern as teaching was directed to the majority. Many of those who reported low levels of ICT access at school were secondary students who were not studying subjects which require ICT to prepare them for examinations.

Students at all levels reported some use of home computing for their homework. Students at Key Stage 4, in particular, reported that they regularly used computers in their work at home. At the primary level, it was found that children were less well equipped than secondary students to take advantage of home-school links given their relatively poorer levels of home resourcing. This has obvious implications for the development of personalised learning at this level. Allowing pupils to take a laptop home on a regular basis resolved the issue in some schools.

ICT makes it much easier to share assessment information with parents via school websites or learning platforms.

Communication between home and school will remain paper-based for the foreseeable future, but schools were increasingly making significant use of either their websites or their learning platform to provide parents with information to support them in supporting their children's learning. The increasing quality and sophistication of this provision in the project schools was encouraging.

One primary website includes digital photographs which provide a means of quickly showcasing and recording key events. Parents can access static information such as the school prospectus and school uniform guide, as well as policy documents relating to home/school and internet use for example. They can also access information that is updated termly or annually such as lunch menus, important dates and after-school clubs. Finally, parents can access a summary of their child's lessons which is updated weekly. This presents information on each subject and identifies how parents can help their child at home, identifying weekly spellings, for example. This information is updated weekly and systematically by two teaching assistants. In addition, the monthly newsletter is made available and presentations from information evenings – on, for example, how to learn to read – can be downloaded.

The provision of parental access to learning platforms relies on parents having the equipment and ICT skills to access the system. Some schools provided parents with access to ICT within the school, and some provide training courses, often with the support of the FE college. It appeared that the younger the age group of the students, the more likely it seems that parents took up the training opportunities, perhaps because the parents were younger too, though grandparents also often attended.

Schools are slowly increasing their use of email – and, in some cases, text messages – to communicate with parents. This enables them to respond to parental enquiries more rapidly.

There were clear signs of increased use of email for contacting parents. In secondary schools, this was an important means of keeping in contact with parents, while in primary schools it supplements regular daily meetings. There are, however, issues relating to the language of emails and to whom and from whom they are addressed. Safeguarding protocols need to be developed, covering who should have access.

Email communication makes responses to parental queries more immediate and provides an automatic record.

While ICT activities remain limited to more of a 'school to home' activity than a sustained pattern of interchange between home and school, growth in this area is expected to continue.

Increasing home access to ICT and the internet is operationally difficult for schools. It is very time-consuming and requires careful planning.

Schools that attempted to make significant provision of computers to homes found that procurement and roll-out of home computers was hugely time-consuming and required careful planning. This major undertaking imposed an impossible workload on teachers and/or school administrative staff alongside a full-time job. Procedures for retrieving and cleaning computers when families move and/or children leave the school need to be in place and, again, may add to administrative burdens.

The costs for schools of licences for software to use on home computers were prohibitive, as was the cost of providing up-to-date anti-virus software. Providing laptops instead of PCs reduced the former cost, as it avoided the need to purchase home licences because the machines carry the software from school to home, though this again took up the time of both school staff and parents in collecting the machines.

Providing connectivity in homes was also fraught with problems. Many homes in socio-economically deprived areas do not have telephone landlines, relying instead on mobile telephones; there are also technical problems in connecting some homes by telephone and others by cable. The costs of connectivity for every home were too much for schools to bear and a more comprehensive community solution needs to be sought.

As the project has developed, however, these difficulties were to some extent being ameliorated by changes in social expectations which have seen a substantial increase in the availability of ICT in homes. There remains, however, a small group of learners for whom computer access at home is not available and provision needs to be made for these pupils as schools increasingly expect and plan for this resource.

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Appendix A

A list of reports available on the ICT Test Bed Evaluation website [www.evaluation.icctestbed.org.uk].

Full name	Abbreviated name	Report description
Technical Report 1, 2003	T1/03	Questionnaires Year 1
Technical Report 2, 2004	T2/03	Year 1 interim report September 2003 (maturity model, benchmarking and questionnaire – development only, no data)
Technical Report 3, 2003	T3/03	Benchmarking Year 1 (Year 1 schools data and FE matching procedure)
Technical Report 4, 2003	T4/03	Year 1 annual report 2003 (Year 1 questionnaires write-up, Year 1 benchmarking analyses)
Technical Report 5, 2004	T5/04	Synoptic report drawn from the interim report September 2003 and the first annual report
Technical Report 6, 2004	T6/04	Questionnaires Year 2
Technical Report 7, 2004	T7/04	Maturity model Year 2
Technical Report 8, 2004	T8/04	Maturity model Year 2 summary
Technical Report 9, 2004	T9/04	Benchmarking Year 2
Technical Report 10, 2004	T10/04	Year 2 interim report September 2004 (Year 1 FE benchmarking, Year 1 maturity model, Year 2 preliminary questionnaire analyses)

Quantitative reports produced by the team at Nottingham Trent University:

Full name	Abbreviated name	Report description
Technical Report 11, 2005	T11/05	Year 2 annual report January 2005 (Year 2 questionnaires)
Technical Report 12, 2005	T12/05	Maturity model Year 3
Technical Report 13, 2005	T13/05	Maturity model Year 3 – Additional analyses November 2006
Technical Report 14, 2005	T14/05	Benchmarking Year 3
Technical Report 15, 2005	T15/05	Questionnaires Year 3 summary
Technical Report 16, 2005	T16/05	Questionnaires Year 3
Technical Report 17, 2005	T17/05	Benchmarking short report
Technical Report 18, 2005	T18/05	Year 3 annual report 2005 (Year 2 benchmarking, Year 3 questionnaires, Year 3 maturity model)
Technical Report 19, 2006	T19/06	Questionnaires Year 4
Technical Report 20, 2006	T20/06	Maturity model Year 4
Technical Report 21, 2006	T21/06	Benchmarking Year 4
Technical Report 22, 2006	T22/06	Additional benchmarking Year 3
Technical Report 23, 2006	T23/06	Personalised learning report Year 4
Technical Report 24, 2006	T24/06	Maturity model self-review Year 4
Technical Report 25, 2006	T25/06	Cluster contextual data
Technical Report 26, 2007	T26/07	Maturity model additional analyses Year 4
Technical Report 27, 2007	T27/07	Test Bed final report

Qualitative reports produced by the team at Manchester Metropolitan University:

Main report	Qualitative Evaluation Final Report 2007
FR1	Heads'/Principals' Perceptions of the Action-planning Process in Year 1 (Autumn Term, 2003) – Bridget Somekh
FR2	Teaching and Learning: the Impact of Whole-class Technologies (Autumn Term, 2004) – Cathy Lewin, Diane Mavers, Diane Saxon and Derek Woodrow
FR3	Evidence from the Workforce (Spring Term, 2005) – Cathy Lewin, Diane Mavers, Diane Saxon and Derek Woodrow
FR4	Leadership and Management in the Three Further Education Colleges (Summer Term, 2005) – Bridget Somekh and Diane Saxon
FR5	Learner Perceptions of the Impact of ICT on their Education (Summer Term, 2005) – Janis Jarvis, Diane Mavers, Diane Saxon and Derek Woodrow
FR6	Management Information Systems and Virtual Learning Environments in Schools and Colleges (Autumn Term, 2005) – J Jarvis, S Steadman, Diane Saxon and Derek Woodrow
FR7	The Role of ICT in Enhancing Learning and Assessment (Spring Term, 2006) – Cathy Lewin, Diane Saxon and Derek Woodrow
FR8	The Organisation of Content and Resources (Summer Term, 2006) – Diane Saxon and Derek Woodrow with Cathy Lewin
FR9	A Case Study of the Learning Platform(s) in One Cluster (Summer Term, 2006) – Cathy Lewin
FR10	Additional Questionnaire Data (Autumn Term, 2006) – Jean Underwood, Gayle Dillon and Derek Woodrow

Action research reports:

Main report	Qualitative Evaluation Final Report 2007
AR	Cross-case Analysis of the Action Research Reports
EAR	Evaluation of the Impact of Action Research on Participating Teachers

Case studies produced by teachers, staff and others in project schools:

Alan Skinner	Crook Community Learning Centre	Designing small-scale workshops to introduce new technology (digital cameras) in a community learning centre
Alan Skinner	Crook Community Learning Centre	Using ICT to encourage students with visual impairment to participate in lifelong learning
Alan Skinner	Crook Community Learning Centre	Evaluating ICT in improving participation and progression with "hard to reach" learners
Alan Skinner	Crook Community Learning Centre	ICT as a contributory factor in changing adult lives
Angela Bhandari	Sandwell College	Encouraging A level accounting students' participation in sessions through use of the video playback facility on interactive whiteboards
Bal Kaur	Sandwell College	A student's experience of video-conferencing
Barbara Scott	Willington Primary School	Monitoring the impact of using digital blue video cameras in whole classes with an emphasis on children of lower ability

Bashir Mulla	Barking College	Collaboration between content developers and teaching staff within a college
Caroline Percival	Hartside Primary School	Researching whether the use of ICT in reception motivates and promotes children's learning in numeracy
Charlotte Ashton	Hartside Primary School	Year 3 pupils' changing perceptions about taking laptops home
Charlotte Ashton	Hartside Primary School	The role of animation software in helping to increase boys' creativity in story writing
Chris Cooper	Sandwell College	Evaluation of the effectiveness of a series of digitised video clips as a teaching aid.
Christopher Skilbeck	Sandwell College	Teaching by video-conferencing: A teacher's log of the experience
Dr Christopher Skilbeck	(Sandwell College now based in Los Angeles)	Making learning by video-conferencing interactive
Chris Varnom	Manor Junior School	Using ICT to support still life in the art curriculum
Claire Jones and Jennifer Williams	Bishop Auckland College	Improved communication with employers and partners in the arrangement of work placements for students through the use of ICT (using email)
Claire Price	Hunwick Primary School	Improving teaching and learning through the use of microscopes in Years 3 and 4 science
Claire Jones	Bishop Auckland College	Widening participation by overcoming barriers to ICT: a case study of Further Education and nursery collaboration
Claire Jones	Bishop Auckland College	The use of interactive whiteboards in the Further Education (FE) classroom with entry level students (promethean and smart boards).
Claire Price	Hunwick Primary School	Can digital microscopes promote learning in literacy lessons?
Claire Price and Jayne Hagar	Hunwick Primary School	Developing keyboard skills in reception children
Clare McLaughlin	Barking College	Investigating how using ICT software could help English for speakers of other language (ESOL) students to improve speaking and pronunciation
Cynthia Pinner	The Cape Primary School	Creating innovative learning resources for the interactive whiteboard for use with Year 1 English as an additional language (EAL) pupils
Cynthia Pinner	The Cape Primary School	Innovative use of the interactive whiteboard with Year 1 English as an additional language (EAL) pupils in literacy
Cynthia Pinner	The Cape Primary School	Innovative use of the interactive whiteboard with Year 1 English as an additional language (EAL) pupils in numeracy
Eimear O'Flaherty	Warren Junior School	Investigating an ICT-based solution to meet the sentence writing needs of a child with autism
Elaine Mattinson	Bishop Auckland College	An evaluation of the impact of an e-mentoring scheme introduced to ten Level 3 childcare and education students within a college of Further Education
Elaine Mattinson	Bishop Auckland College	Engaging with non-traditional learners - a collaborative approach

Elaine Mattinson	Bishop Auckland College	Exploring Level 3 child care students' perceptions of how ICT contributes to their learning
Elaine Mattinson	Bishop Auckland College	Exploring IT, including email, to support the learning of childcare students
Elaine Mattinson	Bishop Auckland College	Establishing an e-mentor system for diploma in childcare and education Level 3 students
Elaine Mattinson	Bishop Auckland College	Evaluating e-mentoring: researching a second cycle of the process
Elaine Pace	Furze Infants School:	Developing programs to assist a classroom assistant's support with speech and language acquisition
Elizabeth Hayton	Willington CE Primary School	Reflecting on the methods and techniques used to evaluate ICT.
Elizabeth Hayton	Willington CE Primary School	Evaluating the contribution which a digital camera and interactive whiteboard can make to improve speaking and listening in the nursery
Elizabeth Hayton	Willington CE Primary School	Evaluating the effect of ICT on two children with specific learning difficulties
Ellie Burkett	Warren Comprehensive	Using handheld computers to stimulate critical studies in A-Level art
Emma Prior	Willington CE Primary School	How the interactive whiteboard has changed the way I teach
Geoff Swinton	Sunnybrow Primary School	Gathering evidence of change in school halfway through the ICT Test Bed project
Geoff Swinton	Sunnybrow Primary School	ICT Test Bed sustainability: A school leader's reflections
Geraldine Metcalf	Bishop Auckland College	Using a learning platform to support hairdressing students
Jackie Barbet	Furze Infants' School	Using interactive teaching equipment in assemblies
Jackie Barbet	Furze Infants School	Aiming to make Furze Infants' School a centre of excellence for children with special educational needs with the support of the ICT Test Bed project
Jackie Roberts	Furze Infant School	A headteacher's reflections on changes in behaviours and practises resulting from the ICT Test Bed project
James Ballard	VLE Administrator	Evaluating student experiences of the Moodle VLE at Barking College
Jayne Hagar	Hunwick Primary School	To research how talking photo albums could improve children's learning
Jayne Hagar	Hunwick Primary School	To research how action words could improve children's learning by using an interactive whiteboard
Joanne Frost	Crook Community Learning Centre	Evaluation of new ICT resources in a community learning centre
John Wearmouth	Willington CE Primary School	Evaluating the introduction of digital film making in the primary school using a digital video camera and an Apple iMac computer system
Judith Russell	Hunwick Primary School	Exploring how the digital blue camera can improve special needs children's communication and listening skills in Year 1
Julie Bedford	Hartside Primary School	An evaluation of the contribution ICT can make to the music curriculum
Julie Fisher	St Cuthbert's RC Nursery	An evaluation of the impact of ICT on boys' attitudes to literacy in early foundation stage. A focused study on four learners

Julie Toothill	Hartside Primary School	Evaluating the contribution which ICT art programs (revelation natural art) make to improving art skills
Julie Toothill	Hartside Primary School	Using laptop computers to improve children's report writing skills Julie Toothill, Hartside Primary School, Co. Durham
Julie Toothill	Hartside Primary School	Evaluating the contribution of Activote as a formative assessment tool
Kate Gair	Sunnybrow Primary School	Using talking books at home to encourage speaking skills with a class of Year 1 and 2 children
Kate Gair	Sunnybrow Primary School	Video-conferencing opportunities in Year 1: a classroom case study
Kate Webley	Shireland Language College	Helping low achievers access computer-aided design / computer-aided manufacture (CAD/CAM)
Kathy Glendenning	Spennymore Community Learning Centre	An administrator's role in supporting learners in the community
Kitt Baguley	Barking College	Creating materials for low-level English for speakers of other languages (ESOL) students
Kitt Baguley	Barking College	Evaluating the use of ICT to support delivery of English for speakers of other languages (ESOL) tutorials and to encourage independent learning
Lesley Oliver	Hunwick Primary School	Building confidence in primary literacy through ICT support
Lesley Oliver	Hunwick Primary School	Investigating the use of the local area network (LAN) in a primary school
Lucy Hutchinson	Bishop Auckland College	Developing digital portfolios for students at Bishop Auckland College
Lucy Jayes	The Cape Primary School	The use of multi-media to help Year 3 and 4 students understand the evaluation and editing of their own work
Lynn Roberts	Furze Infants School	Using digital video to help the transition from infant to junior school
Lynn Skinner	Hunwick Primary School	Evaluating the contribution which an interactive whiteboard can make to improving letter formation in the reception class
Lynn Skinner	Hunwick Primary School	Can interactive programs motivate children to write independently?
Martin Holt	Hunwick Primary School	Evaluating the contribution of Activote within the classroom
Matthew Goodyear	Warren Junior School	How can I ensure that teachers and pupils understand how to use our new wireless laptops?
Michelle Postma	Bishop Auckland College Newgate Learning Centre	To what extent do bite-sized ICT courses widen participation opportunities?
Pat Bone	Bishop Auckland College	An investigation into the introduction and potential of an interactive voting system to promote learning and achievement within an FE college
Pauline Blade	Furze Infants School	A collaborative approach to developing software to help Year 2 children in the 'catch-up' maths group
Pauline Blade	Furze Infants School	Evaluating software resources produced as a collaboration between a learning support assistant and a content developer

Peter Carden	Bishop Auckland College	Using ICT to improve plumbing students' experiences
Peter Crisp	Sandwell College	Establishing video-conferencing
Peter Crisp	Sandwell College	The HeadStart maths program: A case study
Rachel Dobinson	Whitworth Special School	Comparing the use of shared stories in the literacy hour, using an interactive whiteboard or a big book with Year 2 and 3 children who have special educational needs
Rhodri Stone	Warren Junior School	How can technical support in a school help teachers?
Richard Wright	Barking College	Collaboration between schools and college: learning from the content workshop road show
Ros Angela Bhandari	Sandwell College	Using digital video in the role play of an A Level business studies board of director's meeting
Richard R Moulton	Sunnyside Primary School	Learning to listen: Using ICT to capture pupils' perceptions and help the teacher to respond
Rosemary Wright	Barking College	Designing electronic ESOL resources
Sam Leonard	Willington CE Primary School	Evaluating the effectiveness of the interactive whiteboard in the introduction and teaching of the concept of measure in the reception class
Sandra Hall	Bishop Auckland College	Raising childcare students' self-esteem through the production of an electronic portfolio
Sandra Hall	Bishop Auckland College	Designing an interactive whiteboard game to encourage childcare students to participate and contribute in class
Sandra Rudd	St Cuthbert's RC Nursery	How do children use computers in the nursery?
Sarah Barbet-Sawyer	Furze Infants School	Using the digital camera to improve school / home links
Sarah Mangle	Hunwick Primary School	Using digital video to improve children's capacity to evaluate their literacy productions
Sarah Sawyer	Furze Infant School	Using ICT as a focus for self-assessment in Year 2 English lessons
Sarah Mangle	Hunwick Primary School	Researching how digital video helps lower-ability children to develop their vocabulary
Sarah Mangle	Hunwick Primary School	Evaluating how ICT can help develop confidence in two underachieving Year 3 children.
Sharon Metcalfe	Bishop Auckland College	Investigating staff usage of email
Shearon Gordon	Ripple Infants' School	Integrating art in ICT in the primary classroom
Sue Smith	Hunwick Primary School	Reaching out; A school leader's reflections on comparative approaches to involving the community in ICT initiatives.
Susan Duggan	Bishop Auckland College	Exploring the use of the interactive whiteboard with a large group of Level 2 child care students
Tim Morgan	Barking College	Supporting digital video: some lessons learnt
Tim Morgan	Barking College	Teacher and developer collaboration: Creating e-learning teaching
Tim Morgan	Barking College	Helping teachers create appropriate ICT learning resources

Tim Morgan	Barking College	Developing and evaluating effective e-learning resources with FE ESOL teachers
Tony Martin	Sandwell College	Teacher and students' perspectives on Smartboard use in Access and A-Level classes
Victoria Eaton	Sunnybrow Primary School	The changing role of the teacher in using the interactive whiteboard (IWB)
Vivien Bailey	Warren Junior School	Using the classroom performance system (CPS) for spelling tests
Vivien Bailey	Warren Junior School	An action research study into the use of a daily board
Wendy Clark	Furze Infants' School	Making a video diary to see if the digital blue camera as a tool for self expression can have an impact on a child with Asperger's Syndrome
Wendy Clark	Furze Infants' School	Diary of a support assistant
Will Ellis	Sandwell College	Developing a flexible A-Level strategy using ICT
Yvonne Seymour	The Cape Primary School	The impact of ICT on children with autistic spectrum disorder

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