National Research and Development Centre
for adult literacy and numeracy

EFFECTIVE TEACHING AND LEARNING

Using ICT

SUMMARY REPORT

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Published by the National Research and Development Centre for Adult Literacy and Numeracy

This document is also available in pdf and text-only format from the NRDC's website, **www.nrdc.org.uk**. It is the summary version of the project's full report, which was also published in February 2007.

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ISBN 1-905188-33-1

NRDC is a consortium of partners led by the Institute of Education, University of London (see back cover for a list of members) and is part of the Bedford Group for Lifecourse and Statistical Studies at the IoE.
www.ioe.ac.uk/bedfordgroup

Design: info@chapmandesign.net
Print: Redlin
Cover photo: iStock.com

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Introduction

■ The *Skills for Life* Strategy in England has led to unprecedented investment in adult literacy, language and numeracy (LLN), major reforms of teacher education and training, and the introduction of national standards, core curricula and assessment to inform teaching and learning. We have a unique opportunity to make a step change in improving levels of adult skills. But until recently too little was known about effective teaching and learning practices, and reports from Ofsted and the Adult Learning Inspectorate repeatedly drew attention to the quality of teaching, and the need for standards to improve.

It has been a strategic priority at the National Research and Development Centre for Adult Literacy and Numeracy (NRDC) to investigate teaching and learning practices in all the subject areas and settings in *Skills for Life*: to report on the most promising and effective practices, and to provide teachers and trainers, along with policy-makers and researchers, with an unparalleled evidence base on which to build on the progress already made.

Our findings and recommendations are reported here, and in the four companion reports covering reading, writing, numeracy and ESOL. The five studies, which have been co-ordinated by NRDC Associate Director John Vorhaus, provide material for improving the quality of teaching and learning, and for informing developments in initial teacher education and continuing professional development (CPD). We are also preparing a range of practitioner guides and development materials, as a major new resource for teachers and teacher educators. They will explore and develop the examples of good and promising practice documented in these pages.

The Moser Report (Department for Education and Employment, 1999) placed great emphasis on ICT, which has been classed as a 'skill for life' within the *Skills for Life* strategy since 2003. It said: 'At the heart of improved quality in delivery and materials must be increased use of Information and Communication Technologies to improve basic skills.' The report went on to assert that ICT is a powerful tool to raise levels of literacy and numeracy. This new report looks into the teaching and learning of ICT, and finds evidence to support many of the claims made about learning with ICT in the Moser Report. It adds to the evidence from previous research on ICT in *Skills for Life*, including the DfES Survey of Needs and Impact (2003), making important recommendations for developing teaching and learning in ways which include ICT, as new uses of literacy and numeracy and new technologies emerge.

Ursula Howard, Director, NRDC

The Effective Practice Studies

■ The five NRDC Effective Practice Studies explore teaching and learning in reading, writing, numeracy, ESOL and ICT, and they set out to answer two questions:

- how can teaching, learning and assessing literacy, numeracy, ESOL and ICT be improved?
- which factors contribute to successful learning?

Even before NRDC was set up it was apparent from reviews of the field that there was little reliable research-based evidence to answer these questions. Various NRDC reviews showed that progress in amassing such evidence, though welcome where it was occurring, was slow. Four preliminary studies on reading, writing, ESOL and ICT were undertaken between 2002 and 2004. However, we recognised the urgent need to build on these in order greatly to increase the research base for the practice of teaching these subjects.

The inspiration for the design of the five projects was a study in the United States of the teaching of literacy and English language to adult learners for whom English is an additional language (Condelli et al., 2003). This study was the first of its kind, and the lead author, Larry Condelli, of the American Institutes for Research, has acted as an expert adviser on all five NRDC projects.

Our research began in July 2003 and was completed in March 2006. We set out to recruit and gather information on 500 learners in each study, assess their attainment and attitudes at two points during the year in which they were participating in the study, interview both learners and teachers, observe the strategies their teachers used, and correlate those strategies with changes in the learners' attainment and attitudes. The ICT study differed from the others in that its first phase was developmental, its sample size was smaller, and it had a shorter timescale, completing in March 2005.

Main findings

■ Evaluation trials showed that learners involved in this study improved in almost all cases in both literacy/ESOL skills and ICT skills and confidence, often to a statistically significant degree.

Factors affecting learning-teaching events
The learners' age was a significant factor in predicting learning gains, older learners making least progress in terms of ESOL skills and older men (but not women) acquiring more ICT skills and confidence.

Learners who started out with lower ICT confidence scores were less likely to attend frequently and more likely to drop out, highlighting the issue that, while ICT-based teaching can be very successful for many learners, others with low ICT confidence are unable to take full advantage of the approach.

No correlation was found between changes in ICT skills and ICT confidence scores and changes in reading and listening scores, suggesting that the two areas of skills are learned independently.

Learning and teaching resources
While a very small number of learners said that they found the technology a distraction from their language work, most users found the use of ICT motivating.

Mobile technologies (tablets, personal digital assistants, mobile phones) were found to be particularly motivating, and enabled greater flexibility in teaching.

The nature of learning-teaching events
Acquisition of ICT skills and confidence increased in proportion to the amount of time spent using the technology, with use of the internet, PowerPoint and word-processing proving particularly beneficial.

Approaches to teaching
Classes where learners spent more time working individually showed better gains in ICT skills (although not ICT confidence) than those classes where more time was spent working in small groups.

On many occasions, collaboration was observed to be effective, and it could be important in bolstering learners' confidence in using technology.

When collaborative work was forced by the need to share technology it was not as successful as when tutors developed tasks that required peer interaction.

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When technology was shared, one person sometimes dominated its use, possibly undermining the usefulness of collaborative work for developing ICT skills.

Construction of artefacts and role-play often provided a useful focus, generating motivation, collaboration and purposeful action.

The management of learning
Teaching strategies that aimed to increase the autonomy of learners led to gains in both ICT skills and confidence.

Encouraging learner autonomy gave teachers more time to get to know their learners, adapt their teaching to their learners' needs and manage classroom activities.

The most effective teaching strategy was Extending, where the tutor built on/added to material previously introduced by them, or added to a comment by a learner. The Extending strategy was particularly effective when a conventional whiteboard was used.

Other teaching activities associated with improvements in ICT skills were: Discussing, Instructing, Listening and Modelling (showing the learner how to do something using the actual technology or a SMARTBoard interactive whiteboard).

The strategy of Explaining (telling the learner how to do something) had a negative effect on ICT skills and confidence.

Tutor use of PowerPoint had a negative effect on learners' ICT skills.

No correlations were found between any of the observed teaching strategies and changes in performance in the reading and listening tests.

Different types of outcomes
ICT can change the focus on the knowledge to be learnt, as evidenced by tutors talking more about managing information and less about learning it, or more about browsing and scanning and less about comprehension.

Tutors sought to develop their learners' ability to evaluate ICT resources, embrace new skills and transfer skills from one context to another.

Recommendations

Policy
The findings of this project lend strong support to the claim in the Moser Report that 'Learners who use ICT for basic skills double the value of their study time, acquiring two sets of skills at the same time.' The main policy recommendation therefore is that the use of ICT in the teaching of *Skills for Life* should be supported for this reason.

Development work and quality improvement
This project has demonstrated a range of effective approaches to using ICT in *Skills for Life*, which can help learners to acquire both ICT and literacy skills at the same time. To enable the best use of ICT to be embedded in the delivery of *Skills for Life*, further development of resources and exemplar materials is needed, together with appropriate forms of tutor training.

The project demonstrated both the usefulness of having good exemplars, and how time-consuming the production of such materials can be. Significant investment is needed in this process, and appropriate methods of dissemination of exemplars need to be devised.

Two forms of staff development are proposed here – an intensive action-research-based training for those who will generate and develop models of ICT use, and a less intensive training for those who wish to pick up and adapt tried and tested models.

Teacher training in this area should be organised within the context of purposeful use of ICT, and focus on the four elements of effective design which we identified: collaborative learning, learner autonomy, variety of technologies, and construction of artefacts.

Research
Literacies are changing as technology develops, and the relationship between ICT and other literacies continues to evolve.

In the near future we are likely to see wider use of technologies such as interactive digital TV and mobile phones, and the further development of ubiquitous computing.

Continued research will be needed to determine the most effective ways of using these technologies in adult learning.

Background to the study

As the Introduction to this report points out, the Moser Committee acknowledged that ICT is a powerful means of raising levels of adult literacy and numeracy. It said that:

- The Web enables access to the best materials and the most exciting learning opportunities.
- ICT offers a new start for adults returning to learning.
- The internet and digital TV technology can reach into the home.

In order to throw light on these and other claims that the Moser Committee made, we have previously carried out a number of evaluation studies of the use of ICT in the teaching of adult literacy and numeracy for the Basic Skills Agency, Department for Education and Skills (DfES) and for Ufi/learndirect. This research found some positive signs, but suggested that there was a long way to go if expectations were to be met.

Much of the earlier research in this area was based on surveys or interviews, and while it gave an insight into some of the principal variables that may be involved, it provided few detailed accounts of what tutors actually do when using ICT. We therefore carried out detailed observational research in classrooms, and reported on the findings in Mellar et al. (2004). These findings then enabled the generation of a first set of hypotheses about effective strategies, which formed the starting point for the present study.

The project reported here was conducted as part of the research agenda developed by NRDC. It was carried out by the Institute of Education, University of London, and completed in March 2005.

Aims

We set out to develop and evaluate effective ICT-based teaching strategies, and were looking for development of both literacy and numeracy skills and ICT literacy skills. These strategies were collaboratively developed by the tutors involved in the work and the research team, using theoretically grounded ICT task designs targeted at specific learning objectives.

Specific questions

Our main questions were firstly to identify effective ways of using ICT to support the learning of other *Skills for Life*, and secondly to identify effective ways of learning ICT skills themselves. We also sought to gather data on three other issues:

- the motivational impact of ICT on learners

- how ICT was impacting on the wider learning context
- effective support for the development of tutors in the use of ICT in *Skills for Life*.

Method

In the development phase of the study (July 2003 to July 2004) we worked with nine tutors in devising uses of ICT to support learning in their classroom contexts. At the end of this development phase, the tutors created case studies of their approaches, which we hope to make available soon.

In the second phase (October 2004 to March 2005), seven scenarios of ICT use covering a range of technologies, software and pedagogical approaches were evaluated. Each project was led by the practitioner-researcher who developed the approach, and usually also included another tutor (a 'buddy') who implemented the same approach.

At the start of this evaluation phase, the learners were given tests on ICT skills, ICT confidence and ESOL listening skills and/or the GO reading test developed by the National Foundation for Educational Research. The teaching sessions totalled 40 hours, spread over two terms. Each classroom was observed on three occasions, and a sample of individual learners was additionally observed carrying out the tasks. Learners were again tested at the end of the teaching sessions.

Teaching adult learners

While much that might be said about ICT and learning and teaching could be common for a wide range of learners, there are a number of key points which we believe are of specific concern for adult learners, and which informed the design of our interventions.

Factors affecting learning-teaching events

- Adults have differing expectations about ICT, and may also lack confidence in the use of technology.
- There may be differences between the ICT skills and attitudes to technology of younger and older adult learners, and particular care may need to be taken to develop the skills of older learners.
- The use of a wide range of up-to-date digital technologies might be motivational for adults.

The political/institutional context

- Adequate access to resources is something that *Skills for Life* learners sometimes struggle to obtain.
- The relationship of ICT to employment is one of great significance for many adults, and is often part of the reason they are doing these courses.

Approaches to teaching

Ways of employing ICT in order to develop experiential learning that may be of importance to adult learners include:

- the (often joint) construction of artefacts

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- enabling learners to act out new roles.

Social interaction

- The encouragement of collaboration between learners is important, but can be difficult to achieve in groups whose composition changes quickly and where learners have different learning goals, as is often the case in adult learning contexts.

The management of learning

- Tutors need to be clear about the role of ICT in the learning process.
- Tutors should encourage learner autonomy, particularly in the case of adults, who need to take charge of their own learning.

Different types of outcomes

- Tutors need to have clear learning objectives for language, literacy and numeracy, and for ICT.
- ICT should be used for a purpose.
- Tutors need to be aware of (and seek to develop) a wider range of important ICT skills, going beyond simple 'technological literacy'.

Wider benefits of learning

- ICT often has a role in the wider life aims of learners outside both learning and work (for example, keeping in touch with friends and relatives through email).

Note on numeracy

During the year we trialled several approaches to using ICT within adult numeracy provision. Unfortunately, the tutors concerned were unable to take the work forward into the evaluation phase of the project because of other work commitments. While this report is therefore concerned largely with ICT and literacy and ESOL, we have since carried out further studies on the use of ICT with adult numeracy. A report will be published by the NRDC later this year.

Case studies

■ The seven studies are named by the type of technological application that each used. The first five cases are ESOL classes based in further education colleges and the last two are community-based literacy classes. The National Test and Mindmaps classes consisted mainly of older, retired, white, UK-born learners with English as a first language, returning to education after a long break. Seventy-one per cent of this group were female, while 30 per cent regarded themselves as having some form of disability.

The other classes consisted mainly of younger immigrants from a wide range of countries, and almost none had English as a first language. About 30 per cent were in full-time education, 30 per cent with full-time family responsibilities and the remainder evenly split between employment and unemployment. Forty-eight per cent of this group were female.

WebQuests

These classes aimed to improve both the language and ICT skills of Entry Level 1 ESOL learners by using WebQuests, an inquiry-orientated activity in which some or all of the information that learners interact with comes from the internet.

The tutor's main objective was to introduce ICT skills by giving students a chance to explore and experiment with computers and the internet and to move away from demonstrations or lengthy paper-based instructions. More specifically, she was interested to see if knowledge of one procedure could transfer to another without much guidance.

Learners were motivated by the need to acquire or improve their English in order to function in the community, and so were keen to improve these skills quickly. By introducing collaboration through small group work, the tutor encouraged learners to ask each other questions before calling on her. However, learners found it difficult to get help other than in their first language, and although there were successful examples of collaboration, the shortness of the tasks was not conducive to them learning from others

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or experimenting, and most of the class was conducted as a large group or one-to-one.

Learners found the WebQuests approach intriguing, and by using both PowerPoint and Word, they learnt to transfer skills from one to the other.

The tutors were particularly focused on learners gaining confidence in speaking in front of the class and answering questions, and they were satisfied with overall progress. The tests confirmed strong gains in ICT skills and confidence.

e-Portfolios

This course used electronic-Portfolios (OPEUS), a web-based technology that allows users to design websites in which they can store and display their work, thus creating electronic books or portfolios. It was intended to develop both language and ICT skills for a group of ESOL learners aged 16–20, who had access to computers outside class hours.

Peer collaboration was invited by the tutor at the short lesson reviews at the end of each session. These allowed learners to discuss their learning achievements. However, the tutor felt that he might not have placed as much emphasis on collaborative working as he had intended, and that the task of producing individual electronic portfolios made learners more self-centred.

Learner autonomy was fostered by the sharing of computers, learners being encouraged to observe or work with a peer before attempting a task on their own. Any learners who completed a task quickly would be invited to help others, although there was a tendency for these 'instructors' to be too directive or to perform the task themselves.

The tutor felt students who started with good ICT skills and a mature attitude to studying benefited most from the approach used, while those with a poorer attitude benefited less, despite having good ICT skills. The test results reflected this complex reality, showing significant gains in ESOL listening and reading comprehension and a non-significant increase in ICT skills.

Tablets

This project used portable tablet PCs, which incorporate handwriting recognition. The aim was to create language learning opportunities for Entry Level 3 ESOL learners through the use of innovative ICT, and to investigate whether the use of tablets could extend the classroom to the real world. It also emphasised collaborative working, with learners sharing tablets in groups of three or four.

Learners were allowed to choose who to work with, and they commonly grouped themselves with others having the same nationality or language, and so used their first language when quick explanations were required.

Peers helped each other with ICT and literacy tasks. But although they took turns to use the pen, the more confident ICT user (not necessarily the most proficient in English) was often seen to take over and/or teach the other.

During a museum visit, the learners interpreted their task in a variety of ways, some copying labels and others taking notes or attempting to draw.

Learners enjoyed using the tablets, preferring them to paper, and were sometimes allowed to take them home.

Test results showed significant gains in ICT skills and ICT confidence, but not in language skills, although some learners felt their writing skills had improved.

m-learning

A group of ESOL learners used handheld computers with mobile phone and camera functionality to send text, images and sounds from various locations to a website, which they edited themselves, working on both their ICT and language skills.

There were 45 learners in four classes, mostly male, and with various first languages. The tutors' aim was to transfer and extend their existing knowledge of text-messaging and emailing.

The work was intended to allow these ESOL learners to develop fluency and competency in English through finding out how to use the technology and engaging in meaningful goal-orientated interaction. Observations indicated that the acting out of the role of interviewer was also a powerful motivator.

Learners who worked together in writing up their information were seen to discuss grammatical forms, and remind each other of what they had learnt in class.

Tutors reduced the amount of explicit instructions in the use of the technology, and concentrated on helping the learners to work out procedures for themselves.

Learners were also encouraged to make greater use of the services on offer at the college, and were sent out in pairs to photograph and interview the people who ran them.

Tests showed significant gains in listening and ICT skills, although ICT confidence did not increase significantly.

Digital video

This course for second language learners (mostly Entry Level 3) aimed to develop both ICT and language skills. The learners used a digital video camera to create films, and were encouraged to take turns and assume different roles.

They began by viewing amateur videos ►

on the BBC website, and this provided rich material in terms of listening practice and oral work.

Most learners came with very few ICT skills, however, and their main reason for joining was to learn about the internet, email and word-processing. Some felt that learning video skills was a distraction.

The ICT tasks were demanding, and there was a less formal focus on language skills. But working together encouraged greater practice of these, and enabled the tutor to take on a more facilitative role.

A very successful aspect of the interviews carried out by the learners for the videoing was that they had to understand and respond to the answers of interviewees.

Facilitating the task of rotating roles as camera person, director, assistant director, interviewer and interviewee was important, but not always successful, with stronger learners sometimes unwilling to help weaker ones.

At times, the need to achieve outcomes dominated other aspects of the teaching-learning situation, and while the tests showed an increase in reading skills and a significant increase in confidence and in ICT skills, they showed a slight decrease in ESOL listening skills.

Mindmaps

The tutor used a Mindmapping program (Inspirations) to support the development of planning for writing skills and email, both as a tool for communication between learners and as writing practice. She aimed equally at achieving literacy as well as ICT skills.

The software was used to help improve the planning of written work through organising thoughts and structuring work into separate paragraphs.

At the start of the course there was little collaboration. The teaching style was principally didactic, with learners mostly encouraged to work through the exercises on their terminals and papers individually. But over time, the tutor introduced peer interaction to improve overall class dynamics and to help her better manage the classroom demands.

Taking a step back and adopting a facilitating role, she found she had more time to observe learners and help them more effectively. For instance, in teaching learners how to use email with attachments, she put them into groups and had the groups email one another, thus encouraging autonomy and reducing the time demands on the tutor.

Learners felt pairing up had helped them with language skills as well as boosting their ICT confidence.

Overall, there seemed to be an improved atmosphere and enhanced communication as learners interacted more.

Tests showed gains in reading and comprehension and significant gains in ICT skills.

National Test

This case study examined community-based provision using computers as a hook to attract mainly older, retired, white women back into education. Learners were encouraged to join a basic ICT class with embedded literacy skills, and to take the National Test in literacy.

The course used online *Skills for Life* resources such as the BBC Skillswise website alongside paper-based materials. The teaching style was mainly individual, one person per PC, with the tutor explaining tasks and instructing. There was some interaction between learners as they asked one another for assistance, but no planning for collaborative working.

The tutor felt that direct teaching better suited her own style and the needs of the learners. She felt that using ICT helped them work at their own level, and noted that positive feedback from the National Test had motivated some to continue working on their own.

Increased participation was observed towards the end of the course with learners gaining enough confidence to ask for more online work to do at their own pace.

While some had difficulty retaining new information between classes, and most were unable to work at home as they either lacked PCs or confidence, several who started with no ICT skills reported making progress. They found the online grammar exercises useful, and tests showed gains both in ICT skills and confidence and in literacy.

Classroom observations

■ An analysis of the qualitative elements of the classroom observational data highlighted three areas of significance: autonomous learning, collaborative learning and differentiation.

Autonomous learning
This was one of the main pedagogic goals of the tutors. The classroom observations showed that this goal was often met through using ICT to develop appropriate tasks that could be undertaken by students with varying skill levels and learning abilities.

Learners were intrigued by the use of WebQuests, for example, and particularly by the fact that they were able to work without needing to understand everything on the screen. They were therefore not held back by their limited ability to read or by the need to call on the tutor. One tutor opted to provide no support at all for learners navigating around online shopping sites, and yet they were still able to complete the task successfully.

In the area of ICT skills particularly, learners were often seen to be making clear progress with relatively little input from the tutors.

In the Mindmap class, the tutor set out to allow more space for exploratory and independent work. Autonomous learning was made possible by the appropriate choice of task and the organisational skills taught through Mindmapping.

However, it is clear that some learners still expected to be taught on a one-to-one basis, and were unwilling to work independently or with others.

Collaboration
Most of the groups began with little collaborative learning, although in some contexts (for example, digital video) learners worked with one another in order to share use of the technology, even though no collaborative tasks had been set. Many of the tutors sought to incorporate more collaborative learning into their teaching over time, but this was not always successful, and a number of issues were observed:

- Sometimes the task set (for example, the construction of e-Portfolios) actually pushed learners towards a more individualised approach.
- While discussion in the groups was often positive, and pairing helped with both language and computer skills, some learners did not trust their partner enough to forgo the teacher's intervention.

- When collaborative work was forced by the need to share technology, it was less successful than when tutors developed tasks requiring peer interaction.

When equipment was shared, it was common for the more confident ICT user (not necessarily the most proficient in English) to take over and/or teach others.

The construction of an artefact – often jointly – was frequently a useful focus, generating motivation, collaboration and purposeful action. In certain contexts, role-play was also important.

Differentiation

The classroom observations highlighted the advantages that ICT has to allow for differentiation, particularly when used to construct an artefact. Some learners preferred to work more quickly or more slowly than their classmates, and the organisation of technology-based activities often made this possible. When learners finished quickly, it was often relatively easy for the tutor to generate extension activities using ICT.

The classroom observations highlighted the advantages that ICT has to allow for differentiation

Learners' progress

Tests
The overall changes on each test, for all the groups combined, were quite large. The effect size[1] for the ICT Skills Assessment was 0.84, for the ICT Confidence Questionnaire 0.58, for the reading test (GO) 0.52, and for the listening test (ESOL) 0.35.

The test results probably understate the learning gains as the tests were general, rather than specific tests of what was being taught. Many of the tutors thought their learners had made greater progress in language than the results were likely to show because the tests did not relate closely to the learning objectives. It was necessary to adopt these tests, however, for comparison with the other studies and in order to create sample sizes that were large enough to allow statistically significant results to be found.

ICT Skills Assessment
All groups improved in ICT skills, significant changes being noted on the digital video, m-learning, tablets, WebQuests and Mindmap schemes of work. There appeared to be a somewhat uniform level of ICT skills levels across the schemes of work after the study. This could be due to a test ceiling effect, but as no learner scored full marks, it may rather be a reflection of the level of ICT to which literacy learners were taught.

In the case of the e-Portfolio scheme of work, the lack of significant measured overall improvement in ICT skills may be because the test did not measure web page authoring skills.

ICT Confidence Questionnaire
Each scheme of work had a positive impact on most learners' ICT confidence. Although some felt their confidence had decreased, there was an overall improvement within each scheme of work. One learner expressed no overall change in confidence, 18 a decrease and 59 an increase. Those working with Mindmaps showed the greatest overall change.

Reading (GO test)
Five of the seven schemes of work used the GO reading assessment.

1 The effect size is the difference between the two means (in this case the pre- and post-test means) divided by the pooled standard deviation. Roughly speaking, a figure of 0.2 indicates a small effect, 0.5 a medium effect and 0.8 a large effect. For comparison, an improvement of one GCSE grade in Maths or English would represent an effect size of 0.5-0.7. This example is taken from What is an 'Effect Size'? A brief introduction, Robert Coe, CEM Centre, Durham University, March 2000 available at http://www.cemcentre.org/renderpage.asp?linkid=30325016

There was an improvement in the mean reading level within each scheme, and although these were relatively large, they were only statistically significant for the e-Portfolio and m-learning schemes. Lack of significance in the others could be due to the low number of participants who took both sets of assessments.

ESOL

Five of the seven schemes of work used the ESOL listening assessment. Learners participating in the WebQuests made the greatest improvement, but this change was not found to be significant (possibly due to the small number who took both assessments), while learners in the e-Portfolio and m-learning schemes made statistically significant improvements.

Comparison between schemes of work

The table compares the effectiveness of the seven schemes of work, showing the mean improvement on each test, and the effect size.

- Digital video: successful in meeting its ICT goals, large effect sizes, literacy gains not significant but very positive, and ESOL losses.
- e-Portfolio: somewhat weak on ICT skills but very effective in delivering literacy and ESOL goals. The ICT skills concentrated on in this course (web page authoring) were not tested.
- Mindmaps: strong impact on ICT, and

Table 1 **Comparisons between the schemes of work**

	ICT Skills			ICT Confidence			GO			ESOL		
	N	Mean improvement (%)	Effect size	N	Mean improvement (%)	Effect size	N	Mean improvement (%)	Effect size	N	Mean improvement (%)	Effect size
WebQuests	7	33*	2.68*	8	20	0.58				5	27	1.08
e-Portfolio	25	5	0.33	26	3	0.18	27	10*	0.66*	23	8*	0.72*
Tablets	20	13*	0.72*	19	21*	0.75*				15	1	0.05
m-learning	19	14*	0.84*	8	8	0.21	14	10*	0.76*	19	7*	0.24*
Digital video	6	9*	0.87*	7	19*	1.24*	5	16	1.49	5	-2	-0.33
Mindmaps	7	47*	4.56*	7	43*	2.06*	6	10	0.54			
National Test	4	33	1.02	2	22	4.83	4	4	0.14			

* indicates statistical significance at at least the 5% level.

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strong positive impact on literacy, though not statistically significant.
- m-learning: strong impact on ICT skills and on literacy and ESOL.
- National Test: big improvement in ICT scores, though not statistically significant, but little impact on literacy.
- Tablets: strong improvements in ICT scores, but little impact on ESOL.
- WebQuests: strong impact on ICT skills, and possibly on ESOL scores, although not statistically significant.

Additional indicators

Motivation

There are many indicators within the observational and interview data of the motivational impact of using ICT. On their own, these observations may say little, but seen together and against the backdrop of the quantitative data, they strengthen the argument that ICT had a strong motivational impact.

On a number of occasions, learners said that they found the ICT aspect of their work intriguing and exciting, that they were highly motivated to attend, and even to buy a PC to continue learning at home. In a discussion after a visit to a museum using the tablets, one learner said that this was the class at which he learnt how to write best, and that he had not expected this given the 'playful' nature of ICT work.

Tutors often reported positive outcomes in terms of learners' motivation following changes in their pedagogic style, and this was confirmed by our observations.

However, in a number of courses, younger learners who were very confident at using the internet to play games, video and music struggled to follow the programme. One tutor suggested that those who had started with good ICT skills and a mature attitude to studying benefited most from the approach used, while those who began with good ICT skills but a negative attitude did not benefit.

Learning experience

Nineteen learners who had been specifically observed in the classroom were interviewed at the end of the trials. They were positive about learning ICT, ESOL, and/or literacy, with just one being unhappy about his ICT learning experience.

Most learners reported that the course had had some impact on their lives, changing their confidence or knowledge, influencing their work and improving social interactions.

Teaching and learning

Use of technology
It was found, not surprisingly, that the more time students spent using technology, the greater the improvement in both their ICT skills and confidence. More specifically, student use of PowerPoint and word- processing was associated with gains in the ICT skills score, although of these, only the use of word-processing was also associated with increased ICT confidence. Interestingly, tutor use of PowerPoint had a negative effect on learners' ICT skills, while use of a whiteboard correlated with improvements in both ICT skills and confidence.

Class organisation
Table 2 shows the distribution of class time between whole class work, small group work and individual work. The time spent working as a whole class correlated significantly with the change in the ESOL listening scores. Those classes where more time was spent working as individuals had better gains in ICT skills, while those classes spending more time working in small groups (2-5) did less well.

Teaching activities
While no relationships were found between any of the teaching practices and changes in literacy and ESOL performance, gains were made in both ICT skills and ICT confidence when tutors spent more time managing small group or individual activities rather than teaching directly. Extending, where the tutor builds on or adds to material previously discussed, or adds to and develops a comment by a learner, was strongly associated with improvements in ICT skills and confidence. There was a strong positive correlation between tutors' use of the whiteboard and the use of Extension, and as noted earlier, there was a correlation between use of a whiteboard and gains in ICT skills and confidence. It is possible, therefore, that tutors used the whiteboard to support them in extending an activity, and it was this use which had the beneficial impact on ICT skills and confidence.

The following teaching activities had significant positive correlations with improvements in the ICT skills scores, although the correlations were small:

- Discussing: Tutor engaged in two-way dialogue with learners.
- Instructing: Tutor telling learners what to do and what task to undertake.
- Listening: Tutor actively listening to learners' comments or questions.
- Modelling: Tutor showing the learner how to do something using the actual technology or its representation on a SMARTBoard.

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On the negative side, Explaining, where the tutor told learners how to do something, was found to be significantly negatively correlated with improvements in ICT skills and ICT confidence scores.

Relationships between test scores
Those who scored well on the ESOL test tended to score well on the GO test, showing that there was some degree of overlap between the skills measured by these tests. In a similar way, those who scored well on the ICT confidence test tended to score well on the ICT skills test. Perhaps unsurprisingly, in all four tests, those starting out with low scores made greater gains than those with higher initial scores.

No correlation was found between change in ICT skills and ICT confidence scores and changes in reading and listening scores. This suggests that the two areas of skills were being learnt independently. However, there were some indications in the data that initial language skills may impact on ICT learning, and conversely that initial ICT skills may impact on language learning. These relationships tended not to survive when age and class size were taken into account. This interaction between skills is clearly an area that is worth further investigation.

Age and gender
There was a negative correlation for ESOL (older learners made least progress), and a positive one for ICT skills and ICT confidence (older learners made most progress). There was a significant positive correlation for males between change in ICT confidence and age, though the relationship for females was not significant. It may be that younger males overestimated their ability at the start of the courses, but at the end had a more realistic view of their skills.

Table 2 **Classroom organisation**

	Individual	Small group	Whole class
WebQuests	49%	16%	35%
e-Portfolio	52%	14%	34%
Tablets	4%	68%	28%
m-learning	33%	40%	27%
Digital video	60%	12%	27%
Mindmaps	64%	10%	26%
National Test	81%	0%	19%
Average	46%	26%	28%

Class size
Test results indicated that learners in smaller classes made greater overall gains than those in larger classes. However, class size was itself related to age: the older learners were in smaller classes, and it is not clear whether the relationship between class size and ICT gains was a reflection of the age of individuals in the class.

Drop-out and attendance
The only statistically significant relationship between attendance and the test results was with the ICT confidence initial score, indicating that those with confidence in their ICT skills were more likely to attend regularly and less likely to drop out.

Tutor development

■ Our approach to development was based on reflection, group meetings, continuing design and on-site support from development officers. Evidence from tutors' diaries and interviews showed that they developed in their understanding of pedagogy with ICT, in particular they demonstrated:

- increased confidence in teaching with technology (awareness that ICT encompasses more than just computers in teaching);
- greater awareness that the use of modern technologies in teaching implies the need to identify new ways of teaching;
- strengthened belief in a learning methodology that puts learner autonomy at its heart;
- greater readiness to change pedagogies to foster peer learning through collaboration;
- more confidence in experimenting and trying new technologies to achieve specific goals.

This process took time and effort, but enabled tutors to develop into confident, innovative users of technology. Several tutors went on to be mentors within the Learning and Skills Development Agency-led project 'Exploring E-Learning for Literacy, Numeracy and ESOL Teachers'.

In the first phase of our project, the tutors had developed robust models of ICT use in literacy and ESOL. In the second phase, they each recruited a 'buddy' to repeat the teaching approaches they had designed. It was found that the tutors were able to induct their buddies relatively quickly. Although the investment in time on the part of the buddies was considerably less than that of their mentors, the tests showed no significant differences between the scores of learners taught by the tutors and those taught by their buddies. The robust models of ICT use developed by the tutors were able to support the buddies' performance.

Implications for professional development

In work that we did with the National Institute of Adult Continuing Education (NIACE) in an action research project looking at the implementation of the ICT *Skills for Life* Curriculum (NIACE, 2005), we were able to obtain data on the backgrounds of a large number of tutors delivering ICT *Skills for Life*. This information suggests that ICT tutors are sometimes poorly prepared for teaching *Skills for Life*, and that *Skills for Life* tutors sometimes have a rather limited view of ICT.

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The tutors we worked with started out as individuals with a special interest in the area, and went through an intensive period of training and reflection, which for some has consolidated their positions as leaders in the field. This intensive form of staff development clearly has an important role to play.

Within the NIACE project there was considerable discussion about the level of ICT knowledge required by tutors. The tutors in this project were delivering both language and ICT skills, and while most were not ICT specialists, neither were they novices. They did take the technology seriously, were often very skilled in particular aspects, and did not treat ICT as 'merely a tool'.

Another issue that came out strongly from the NIACE study was the need for good exemplar materials. As we argued above, given robust models of ICT use, the practices of the tutors could then be relatively efficiently picked up and used by their buddies.

The tutors in this project took the technology seriously, were often very skilled in particular aspects, and did not treat ICT as 'merely a tool'

Conclusions and implications

■ In the evaluation trials, classes improved in almost all cases in both literacy/ESOL skills and ICT skills and confidence, although the balance between improvements in the two sets of skills varied from class to class. The learning gains for classes were often statistically significant, lending strong support to the Moser Report's claim that 'learners who use ICT for basic skills double the value of their study time, acquiring two sets of skills at the same time'.

As we have shown earlier, we had encouraged tutors to change their style of teaching, and as a result, they sometimes saw themselves as taking risks with their pedagogy and were often pleasantly surprised that the changes worked, typically noting that their classes became more social and 'gelled' better, and that pressure on the tutor was reduced so they were able to devote more attention to understanding their learners' needs.

Factors affecting learning-teaching events

The learners' age was a significant factor in predicting learning gains. In the case of ESOL skills, older learners made least progress, and in the case of ICT skills and confidence, older men (but not women) made most progress.

Initial ICT confidence scores correlated with learners' persistence in that those with lower scores were likely to attend less frequently and were more likely to drop out. Although not unexpected, this result does highlight the issue that, while ICT-based teaching can be very successful for many learners, there are others who do not have the necessary levels of ICT confidence to benefit fully from the approach.

No correlation was found between changes in ICT skills and ICT confidence scores and changes in reading (GO) and listening (ESOL) scores, suggesting that the two areas of skills are learned independently. However, there are some suggestions in the data that initial language skills may impact on ICT learning, and also that initial ICT skills may impact on language learning. This is an area worth further investigation.

Learning and teaching resources

Most users found the use of ICT motivating, with only a very small number finding the technology a distraction from their language work. Mobile technologies (tablets, PDAs, mobile phones) were particularly motivating, and enabled greater flexibility in teaching and the opportunity to move outside the

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classroom. Relatively small amounts of mobile technology were made available and it is likely that increased access would be even more effective.

Learning-teaching events
Our tests showed, unsurprisingly, that both ICT skills and confidence improved with the amount of time learners spent using technology. More specifically, learner use of the internet, PowerPoint and word-processing were found to be associated with gains in ICT skills, although tutor use of PowerPoint was negatively correlated with learners' gains in ICT skills, highlighting the need for active involvement on the part of the learner rather than passive observation.

Collaboration
We laid particular emphasis on learner collaboration, and observations indicated that tutors were often successful in managing this. Some carefully structured collaborative activities, though others simply allowed learners to work together in their own ways. However, classes where individual learners spent more time working on their own showed better gains in ICT skills (though not ICT confidence) than those which spent more time working in small groups.

Examination of the classroom observation data showed that there were many occasions where collaboration seemed to be effective, and that it could be especially important in bolstering learners' confidence in using the technology. However, the data also pointed up some problems.

When collaborative work was forced by the need to share technology it was not as successful as when tutors developed tasks that required peer interaction. When technology was shared, one person sometimes dominated the use of the technology, and it is possible that this undermined the usefulness of collaborative work for developing ICT skills.

Collaborative learning faces particular challenges in an adult learning context, where frequent changes in class membership can make it difficult for a tutor to achieve continuity. However, the classroom observations offer sufficient evidence of the potential of collaborative working to support the continued exploration of these approaches, although further work is needed to determine how best to use collaborative work with technology.

Construction of artefacts/role-play
Most of the schemes of work involved learners in the construction of an artefact – often jointly. Classroom observations indicate that this was often a useful focus, generating motivation, collaboration and purposeful action, and also pointed up the value for ICT used in this way in allowing differentiation within the classroom. In certain contexts, role-play was also an important part of these activities – for example, where

learners presented themselves as journalists, photojournalists or TV interviewers.

The management of learning
No correlations were found between any of the observed teaching strategies and changes in performance in the reading (GO) and listening (ESOL) tests, but a number of correlations were found for ICT skills and ICT confidence.

We encouraged teaching strategies that aimed to increase the autonomy of learners so that they were able to engage in self-directed learning, and there was a positive correlation between the amount of time spent by tutors managing activities with gains made in both ICT skills and confidence.

The most effective teaching strategy in terms of ICT skills and confidence was Extending, where the tutor built on/added to material previously introduced by them, or added to a comment by a learner, and the strategy was particularly effective when supported by a conventional whiteboard. Other effective activities that helped to improve ICT skills were: Discussing, Instructing, Listening and Modelling (showing learners how to do something using the actual technology or its representation on a SMARTBoard).

One strategy was found to have a negative effect on ICT skills and confidence, and that was Explaining (where the tutor tells the learner how to do something). Tutor use of PowerPoint also had a negative impact on ICT skills.

Different types of outcomes
ICT can change the focus on the knowledge to be learned. This was evidenced by tutors talking more about managing information, and perhaps less about learning it; more about browsing and scanning and less about comprehension. Going beyond the skills described in the ICT *Skills for Life* Curriculum and those tested in the ICT Skills Assessment, tutors sought to promote a further range of ICT skills, such as the ability to evaluate resources or to transfer skills from one context to another.

Tutor development
Teachers' understanding of pedagogy increased and they developed into confident, innovative users of technology in the classroom. The period of training and reflection within the project enabled some to consolidate their positions as leaders in the field, indicating that such an intensive form of staff development can be important.

Such was the robustness of the models of ICT use employed that tutors' practices could be picked up and used by their 'buddies' with relative efficiency. Clearly, then, two forms of staff development are required – that needed by those who have to generate and develop models of ICT use, and that needed by those who wish to pick up and adapt tried-and-tested models.

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EFFECTIVE TEACHING AND LEARNING

Using ICT

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Funded by the Department for Education and Skills as part of ***Skills for Life***: the national strategy for improving adult literacy and numeracy skills.

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