Transforming Learning? Interactive whiteboards in the primary classroom: case studies from a London school.

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Abstract

Recent UK government initiatives have seen a significant expansion in funding for IT in education (DfES 2003), including interactive whiteboards (IWBs) leading to enthusiastic adoption of this technology in many London primary schools. This paper reports on outcomes from Best Practice Research Projects (DfES 2004) undertaken by a group of London primary school teachers in association with the University of London Institute of Education.

A positive relationship between ‘high’ IT use and raised educational attainment has been shown by some recent UK studies (Becta, 2000; Harrison et al 2002). However, these findings are accompanied by observations that this is dependent upon ‘effective’ use by teachers, suggesting that the pedagogical approach of the teacher is a major factor and that teachers’ subject and pedagogical knowledge determine choices made when integrating IT into teaching (Cox and Webb, 2004). Glover and Miller (2004) identified 3 ‘levels’ of use of IWBs by teachers in their research:

a) **Supported didactic** – where the IWB is used to enhance traditional board-focused didactic teaching

b) **Interactive** – where the teacher recognizes some of the additional benefits of the technology and endeavours to stimulate interactivity by questioning and involvement of pupils

c) **Enhanced interactive** – where the teacher moves from the instructional to the involvement role and uses the technology to stimulate, integrate and develop interactive learning.

Using a case study approach, this paper will explore these issues by considering outcomes from action research projects undertaken by a small group of London Primary School teachers as part of a DFES-funded scheme and attempt to identify some characteristics of classrooms where ‘learning transformations’ may be taking place.

Introduction

The Becta ImpaCT2 - Pupil Learning and Attainment study (Harrison et al, 2002) focused on 60 UK schools and was carried out between 1999 and 2002. A continuum of three stages in the implementation of networked ICT was identified: ’during stage one the main focus is on the provision of equipment infrastructure and support; stage two focuses on teaching ICT skills, often in specialist ICT lessons; stage three moves to the integration of ICT with curriculum subjects, including numeracy and literacy.’ Over the period of the study schools were moving from stage one to two and only a few teachers in a few schools began to move to stage three. The school reported on below was already at stage three by this definition when the research reported on started in 2002, largely due to a whole-school adoption of interactive whiteboards (IWBs).

A strong relationship has been found between the ways ICT is used and pupils’ attainment, suggesting that the pedagogical approach of the teacher is a major factor (Cox and Abbott, 2004). Teachers select the ICT tool, plan lessons: how it is to be used with pupils; the level of intervention and how it is to be integrated into the subject. If the teacher does not understand the scope of the ICT resource it is likely to be less effective or perhaps even inappropriate. As Resnick (2002) points out: ‘learning is not a simple matter of information transmission. Teachers cannot simply pour information into the heads of learners; rather, learning is an active process in which people construct new understandings of the world around them through active exploration, experimentation, discussion, and reflection.’ This has significant implications for the role of ICT in education, and the roles of teachers and pupils. ‘One of the fundamental challenges of ICT, for educational purposes, is to ensure that it actually enhances the quality of the learning experience’ (Noss and Pachler (1999) p196). ‘I want to emphasise that ICT has of itself little more pedagogic value than the quill pen...’ stated Rt. Hon Charles Clarke, MP Secretary of State for Education
and Skills, at his address to the BETT show in January 2003. He went on to explain that whilst the average annual expenditure on ICT in primary schools in the UK rose from £3,600 in 1998 to £15,400 2002/3, this counts for little if the ICT provision is not effectively utilised. However, a research review published the same year by the DfES (2003b) concluded that:

- Generally something positive happens to the attainment of pupils who make (relatively) high use of ICT in their subject learning;
- Schools standards are positively associated with the quality of school ICT resources and quality of their use in teaching and learning, regardless of socio-economic characteristics;
- Use of ICT in class generally motivates pupils to learn;
- Achieving positive impact of ICT on teaching and learning depends critically on the decisions of schools, teachers and pupils on how it is deployed and used. (p.3)

One major ICT development in UK schools recently has been the introduction of interactive whiteboards (IWBs) into many classrooms. Using a combination of a touch sensitive screen with digital projection, these allow teachers to exploit the full range of software available via their computer network, as well as access the internet and online digital resources, directly from the screen whilst a lesson is in progress – in short, they provide a ‘digital hub’ (Lee 2004) for teaching and learning in the classroom. There is growing evidence from the UK and elsewhere that IWBs offer the potential to for teachers to ‘redesign’ pedagogy (Butler 2004; Clarke 2004; Glover and Miller 2004; Jewitt et al 2005; Kemeny 2004, 2005; Kennewell 2004; Lee and Boyle 2003; Moss, 2005; Twigg 2003) Early research highlighted the motivational power of IWBs due to their enhanced presentational facilities and ‘novelty value’ due to the interactivity made possible, but there is growing understanding of the nature of interactive learning potential shown for example in McCormick and Scrimshaw’s (2001) analysis of pedagogic change in teaching mathematics and by Glover and Miller’s (2002) account of changes in teachers’ practice due to IWB use in a secondary school. Some evidence is emerging of how the use of ICT may be altering the pedagogical role of teachers and even that this transformative potential could be a justification for using IT. For example, an analysis of pedagogical ideas underpinning teachers’ accounts of successful use of IT in mathematics lessons found that, ‘As well as serving as a ‘lever’ through which teachers seek to make established practice more effective, technology appears to act as a ‘fulcrum’ for some degree of reorientation of practice and a measured development of teachers’ pedagogical thinking’ (Ruthven and Hennessy, 2002, p.85, quoted in Cox and Webb, 2004, p.18) In this paper, I report on some findings from a small-scale qualitative study in a London primary school with which I was working in a PGCE training partnership as a university tutor.

Background to the project

The project was located in an inner-London 2-form entry primary school which, according to the most recent Ofsted Report ‘serves a socially and ethnically diverse London community’ and is ‘a very effective school’ In addition, ‘there is a clear commitment to improving standards for all pupils which is shared by all the staff and the quality of teaching is good’. The school had good, well-managed provision in ICT and by September 2002 all Key Stage 1 and 2 classrooms had a fixed interactive whiteboard. Standards in ICT were good with many pupils at Key Stage 1 and 2 attaining standards above the national expectation for their age.

The teaching experience of the seven teachers involved ranged from one to six years at the beginning of their involvement with the project. All were enthusiastic, relatively ‘early adopters’ of interactive whiteboard (IWB) technology and were keen to develop their practice further. Overall, the project’s aim was to ‘explore teaching interactively using interactive whiteboards’. Each teacher devised her own research focus with support from me as their mentor and applied successfully for a ‘Best Practice Research Scholarship’ from the DfES, which provided funding for cover for the teachers and mentor support time over the period of one school year. (4 teachers in 2002-3 and 3 in the succeeding academic year) This focus was located within a wider research design which drew on early findings of the Study of PRimary INteractive Teaching (SPRINT) project in which Moyles et al (2001) developed a typology of eight ‘key features’ of interactive teaching. We chose to examine two of these further in the project:

- Broad pupil participation: Constructs referring to strategies that involve the whole class in activity or those that allow the teacher to assess pupil knowledge through whole class presentation of knowledge e.g. the use of whiteboards or ‘letter fans’
Reciprocity and meaning making: Constructs that relate to 'two-way' communication where both teacher-pupil and pupil-teacher interaction is encouraged. Constructs that emphasise the construction of meaning through dialogue rather than didactic approaches.

Our aim was to explore the relationship between classroom practice and learning outcomes using a model adapted by Twining (2002) from Moseley et al, (1999):

We focused at the level of educational practice by using a 'video-stimulated reflective dialogue' (VSRD) (Paterson and Moyles, 2001). Each dialogue explored specific aspects of practice using a shared source of information - a video of a lesson where an interactive whiteboard was used for whole-class teaching which had also been observed by the mentor. The mentor’s role was to provide 'scaffolding' and support during the discussion. Action points were agreed for the next stage of development before the next reflective dialogue. Outcomes from VSRDs were shared and discussed further at termly research group meetings of the teachers with the mentor. The teachers also engaged in self-evaluation, e.g. by keeping a reflective log and storing all their IWB ‘flipcharts’ electronically. At the end of each year of the project, each teacher wrote a reflective account.

Discussion

Teachers’ pedagogy – defined as ‘any conscious activity by one person designed to enhance learning in another’ by Watkins and Mortimore (1999) is influenced by many factors including personal and context-specific ones. As Cox and Webb (2004, op cit) point out in their review of research literature on ICT and pedagogy, ‘teachers’ own pedagogical beliefs and values play an important part in shaping technology-mediated learning opportunities’ (P 4) In deciding how and when to incorporate ICT tools into their lessons, teachers will need to review their practice and develop new pedagogies. In this paper I present some teachers’ accounts of their own research into their pedagogical development when using IWBs in their classrooms with the aim of ‘transforming learning’ for their pupils.

Kennewell (2004 op cit) has identified a number of features or possible affordances of IWBs in his study of primary classroom use of IWBs which focused on an analysis of learner-IWB interaction, teacher-IWB interaction and learner-teacher interaction through the IWB:

*Speed:* making processes happen more quickly than other methods

*Automaticity:* making previously tedious or effortful processes happen automatically

*Capacity:* the storage and retrieval of large amounts of material

*Range:* access to materials from a wider range of sources than otherwise possible

*Provisionality:* the facility to easily change something which has been produced

*Interactivity:* the automatic provision of feedback in response to an action by the user

*Clarity:* the display is easy for pupils to see and interpret

*Authenticity:* the tools and resources are the same or similar to those used by professionals in the field

*Focusability:* the drawing of pupils’ attention to particular aspects of a display or idea

*Accuracy:* items are constructed with greater precision than is realistic manually

*Multimodality:* the facility to switch between visual, aural and textual display
Availability: the scope of resources which can be accessed in practice

Selectability: the facility to make a choice of resources or actions easily implemented

Collatability: the facility to bring together a variety of items from different sources as a single resource

Shareability: the facility to communicate and interchange resources and ideas easily with others

Templating: the provision of a standard outline structure for individuals to add their own ideas

These categories are useful when examining how the teachers are using the IWBs in practice and in what ways this may be changing and developing over time. In order to explore this further, I will also utilize Glover and Miller’s (2004) 3 ‘stages’ in teachers’ pedagogical development when using IWBs in their teaching:

d) Supported didactic – where the IWB is used to enhance traditional board-focused didactic teaching

e) Interactive – where the teacher recognizes some of the additional benefits of the technology and endeavours to stimulate interactivity by questioning and involvement of pupils

f) Enhanced interactive – where the teacher moves from the instructional to the involvement role and uses the technology to stimulate, integrate and develop interactive learning.

At the beginning of their research, each teacher was already well established at the ‘supported didactic’ level – they were routinely using the IWB for much or all of their whole class teaching and had begun to explore features such as the ‘reveal’ tool which allowed them to control how much of a prepared text or activity the class could see as the lesson progressed and interactive quizzes or games for plenaries. The teachers were well-placed to develop their thinking and practice further as they became more skilled and knowledgeable about what the IWBs enabled them to do. During the course of the study, they began to move into the ‘interactive’ stage. Jane, for example, a teacher with 5 years’ classroom experience summed up her investigation of the ‘broad participation’ construct as follows:

‘The research really made me think about the involvement of children in lessons, rather than just what I would be teaching. I feel that I now find more opportunities for interactive activities during whole class teaching sessions. Many of these activities relate to the IWB, such as the use of video or pictures to stimulate discussion, children clicking and dragging words around the board etc. However, other forms of interactive teaching I used were not necessarily related to the IWB, such as paired talk and ‘hot seating’. The main learning point for me is that the IWB is an invaluable teaching tool, but that I should always consider fitness for purpose – sometimes the use of the IWB slows down the pace of a lesson, for example. When teaching writing, the strength of the IWB is that I can build up a unit of text-based reading and writing work over the course of a two-week unit. This includes examples of texts for shared reading, extracts to illustrate teaching points, planning formats/notes as a structure for shared writing, then the shared writing itself, developed from the reading. This enables constant re-visiting of prior learning, reinforcing and linking teaching points. The quality of the resources that I have used has also been far superior – I am no longer fussing about with OHTs and scraps of sugar paper! Children have commented on the quality of these resources, and there is a definite “wow” factor in their response to the IWB, which motivates them in their own writing.’

Jane has identified here several of the ‘affordances’ found by Kennewell in his study including interactivity; multimodality; collatability; shareability; automaticity; availability and focussability. Interestingly, she introduces a further category which I will term ‘revisitability’ – the facility of effortlessly retrieving and reviewing prior learning at any time which many of the teachers found to be a key factor in children’s engagement when learning with IWBs. Joanna, in her second year of teaching in the first year of the project also moved into the ‘interactive’ stage in Glover and Miller’s typology. She interviewed a ‘focus group’ about their attitudes to learning with an IWB:

Through interviewing the children, it was clear that there were specific aspects of the whiteboard that they found to be most appealing and helpful.

? The most common of these was the use of colour. All the children stressed that they found this helped them to focus on different parts of the text (the highlighter pen) and that they liked “having a go.”
? All the children agreed that they enjoyed coming up and “moving things around the board” when they described “marquee select.” They explained that they wanted to be chosen to do this.

? Three of the children claimed that they found lessons more “interesting” and “fun”

? Two of the children liked the way that books could be scanned onto the whiteboard.

Through listening to the children’s responses and observing how they interacted during lessons, it was clear that the children's attention span was increased and they became more focused. I found this to be due to the enthusiasm to take part in the actual functions of the board and the ability to make lesson more visually attractive and accessible to the class. I was able to make word and sentence level work more snappy and enjoyable by using interactive tools which encouraged the children to remain focused and enthusiastic. Tools such as the “pull down blind” and “spot light” were very successful along side the use of the children’s individual white boards. It was evident that the children’s understanding of word and sentence level work progressed throughout the year due to the lessons being more interesting, interactive and memorable. Due to the ability to save previous flipcharts, it was easier to recap with children what they had previously learnt by using visual cues. Therefore the bigger picture was always in place.

Overall, the most clear and evident learning point that I gained was that through effective use of the Interactive whiteboard, all children, regardless of their ability, were able to involve themselves successfully in each lesson and leave with a feeling of satisfaction. This was particularly evident in lower ability children who previously may have felt more daunted in stepping up to the front of the class. I found it easier to cater for these children's needs by using more accessible differentiation in order that they could use a whiteboard tool (both in spelling and sentence work) to demonstrate their understanding. It was also clear that less confident children found physical participation less intimidating than oral participation. Although it is important for all children to have the confidence in speaking and listening, the whiteboard simply acts as a stepping stone towards this goal.

Clarity and focusability were of additional importance to Joanna in her work with her class which had an unusually high (even for this school) number of children with special educational needs including behavioural issues. Towards the end of the year, Joanna began experimenting with the ‘ActivVote’ facility of the IWB which allowed her to gain instant feedback from individual pupils about their understanding of concepts and new ideas. This proved invaluable in allowing her to target and adapt her teaching for individual children. Teachers’ use of the IWB technology became increasingly sophisticated as the first year progressed and the group discussions held allowed the teachers to share and often extend each others’ thinking. This was supported by the developing whole school practice of sharing all lesson plans and resources via the school network. They began to show characteristics of Glover and Miller’s third ‘enhanced interactive’ stage, using the IWB as a ‘digital teaching and learning hub’ as envisaged by Lee (2004 op cit) Fiona, an experienced teacher who had been teaching for 6 years and was the school’s literacy coordinator was using a range of visual and aural stimuli routinely:

The IWB has without a doubt helped to develop my teaching pedagogy. It has made whole class sessions during Literacy much more interactive and appealing to all types of learners in my class. It has enabled me to plan sessions that help auditory, visual and kinaesthetic learners. Unlike my teaching before the introduction of the IWB, my teaching is more multi dimensional.

The use of multi media such as the internet, video, sounds, images has meant that I can plan to introduce texts in a range of ways. Starting with a sound, or an animation or a striking image is much easier to do now, than before the introduction of the IWBs. For example when writing History poems about the Blitz, I started the lesson with the sound of the siren and then a striking photograph of Blitz damage. This helped children to empathise and imagine what it felt like and therefore write more emotive poems. When starting a literacy lesson on rivers and flooding, I started with the sound of running water. This was a really powerful way of ‘hooking’ the children’s interest and getting them to predict what the lesson was going to be about. It also enabled children who perhaps had never even been to a stream to begin to imagine the sounds and experience of being by a river. As one child commented, “it felt like I was there!” This has in turn encouraged much more shared talk and drama which is clearly a vital prerequisite to effective writing.

Fiona centred much of her research on her pupils’ response to learning with an IWB by interviewing a focus group at various stages during the year and then fed back the findings into her own planning and teaching. She found this a very fruitful way to reflect on and develop her own practice and found that the children enjoyed an opportunity for ‘metalearning’ as a result:
The children really enjoyed having the opportunity to discuss how the IWB has helped their learning. They seemed to really appreciate the opportunity to have time to talk about what strategies helped them to become effective learners and how my use of the IWB was supporting them to do this. It also raised awareness amongst the children about how they like to learn and types of support they need during shared discussion and writing in order to help them most effectively in their own progress. The research also made them aware of how much preparation is needed by the teacher in order for the IWB to be used effectively. The children were very aware of the importance of well prepared flipcharts in order to make the lesson stimulating and interactive. They recognised that it was the teacher’s effective and planned use of the technology that made the lessons good rather than the technology itself. As one child said, “It is the teacher who makes the lesson good, not just the whiteboard.”

In the second year of the project, the teachers involved were able to build on the experiences of the previous year by reading the outcomes and discussing with their colleagues how their research had been undertaken. These teachers also showed ‘enhanced interactive’ characteristics in the ways that they were using the IWBs in their teaching. For example, Sarah (in her third year of teaching) began to involve her Key Stage 1 class in making their own ‘flipcharts’:

‘Through a series of lessons carried out using the interactive whiteboard I found that I was increasingly aware of the children’s competence when using the programmes available and teacher-made flipcharts on ‘ActivPrimary’ I decided to pursue a new avenue in my research, which culminated in the final project. As the children were so adept in their use of the whiteboards it seemed a logical step for them to make their own flipcharts. It enabled the children to develop an understanding of the objectives specific to the National Literacy Strategy, explore for themselves the ActivPrimary software, which in turn facilitated and encouraged peer interaction. The class worked on making flipcharts in mixed ability pairs and created a series of pages focusing on the media vowel sound in mainly consonant-vowel-consonant words. The ability to distinguish individual sounds in crucial to a child’s literacy development. (…) The children were involved in a highly complex problem-solving activity throughout the project. They developed their literacy skills and their ICT capabilities in many ways (…) to a level far beyond that of a normal classroom situation. They could search the library for the pictures they needed, use the resizing tool, use the marquee select tool to move the pictures around the page (…) They learned to save and retrieve their flipcharts and add a new page each session (…) The children thoroughly enjoyed sharing their work with the rest of the class, they were thrilled at the prospect of ‘being the teacher’ and the children in the class were equally engaged and participated well beyond my expectations. The children had the opportunity to use their work in an authentic way, giving them ownership of their work as well as meaning for its creation.’

The children in Sarah’s class who worked on this project had supported access to both ‘authenticity’ and ‘accuracy’ in Kennewell’ list of affordances as well as ‘shareability’. She was able to utilise her own considerable expertise and pedagogical skills in using the IWB to extend the learning of her class in a quite remarkable way. A final example of a teacher who seemed to be well advanced towards ‘enhanced interactive’ teaching was Naomi, a second year teacher who also shifted the focus of her research during the project year:

‘I chose to focus the attention of this research not on the use and impact of ICT per se, but rather, on the specific ways in which differing ICT resources (particularly whiteboard tools and programs through the whiteboard) may be used in order to raise the attainment of my pupils. As parallel yardstick for my pupils’ attainment, I chose to concentrate upon their motivation within the learning context. In this sense, I set out to explore the ‘something positive’ within the DfES claim that “generally something positive happens to the attainment of pupils who make relatively high use of ICT in their subject learning” (2003 op cit) I subsequently investigated and determined the effect of ICT upon the level of the children’s engagement, self confidence and learning autonomy – factors fundamental to their motivation. In terms of ICT resources, I set out to identify which ICT activities and tools could be tailored to different learning styles. Specifically, I explored how the use of Promethean’s ActivStudio software – as well as different websites or programs already available in school motivated the children and helped them learn more effectively.
At this stage of my research then, the core question became, “How does the effective use of the IWB software – combined with the internet and different software packages – contribute to more motivated and effective learning?

Naomi used a mixture of whole class discussion, questionnaire, group and individual interviews with selected children to explore these issues further and again, fed the results back into her teaching:

‘The children evidently enjoyed seeing the results of their questionnaires. I began to combine the different tools I was using within on lesson to appeal to the different learners, their styles and motivations.’

She gives an account of a science lesson where she had used this approach:

a) Children dissected a flower and examined different parts under microscopes. I used the digital microscope (connected to the IWB) to model how to focus and what to look for. Children found the pollen on the board and the ovaries especially interesting and the different magnifications on the whiteboard gave the children a good idea of the nature of pollen
b) Children dragged and dropped name labels to the correct parts of plants on the whiteboard
c) Children played the IWB software activities related to plant parts on the IWB and enjoyed the applause when they got the answer right
d) A small group of children at the board played the science clips activity and ‘revisewise’ activity and quiz on the BBC website

Naomi summarises the key factors which she felt contributed to the impact of her project on her pupils:

? The variety of tools and their uses on the IWB (video, microscope, scanned in children’s work to edit, consistent format of literacy topics using accelerated learning approach, interactive games)
? Implementing within lessons their favourite and most exciting tools for learning (sound, video, music, interactive games)
? Increased awareness of their own attitude towards learning, both in terms of what motivates them and what helps them learn revealed through the questionnaires and discussion about the project
? Whole class discussion of motivation and learning styles
? Focus children felt special and chosen, thereby increasing their awareness of their own learning. They felt their opinion mattered and saw their opinions influence my teaching methods.

Interestingly, like Sarah, Naomi was increasingly using the IWB as a teaching tool for small groups: ‘I have found that routinely giving the children opportunities to work at the board with a teaching assistant or independently has given them more ownership over it as a learning resource. They see the board less as a ‘teacher’s tool and more as a toll for their own learning.’

This observation, along with others discussed earlier seem to give us some insight into the potential for IWBs to ‘transform learning’ in the primary classroom, as well as some of the possible processes of professional development teachers could engage in to bring this about. It also highlights the need for pedagogic change, as Glover and Miller (2004 op cit) have argued, from didactic to interactive and for the full integration of technology into teaching and learning.

Conclusion

During the course of this small-scale project, there seemed to be strong evidence of affordances of IWBs in the learning situations found in the project school which echoed those of Kennewell’s earlier study. Teachers were enabled as a result of their participation in the project to analyse their own practice and consider how to develop it further with the support of their colleagues and the mentor. Their reflective accounts demonstrated movement along Glover and Miller’s 3-stage model of teacher’s pedagogical development when teaching with IWBs. Goodison has suggested in his (2003) contrastive study of two lessons taught with IWBs that it is possible for such technologies to contribute ‘very little to the learning process and perhaps even impede it’ (p 565) and argues for ‘staff development in the use of technology (which) should take as its starting point teaching for understanding and the consequences of this for lesson design (p 565 op cit) He advocates an approach to professional development for teachers in the pedagogical
use of ICT which recognizes that ‘it might be more rewarding and productive for staff to conduct their own research, and evaluate the results collectively, rather than attending a course or listening to a series of lectures’ (p566 op cit) The teachers whose findings are reported on in this paper found it a professionally rewarding experience to be involved in this type of activity – as one of them concluded as a result of her involvement in the research ‘teaching has become easier, exciting and a lot more resourceful!’

References