

The interactive whiteboard in an early years classroom: A case study in the impact of a new technology on pedagogy



JOHN VINCENT

The University of
Melbourne
Faculty of Education

ABSTRACT

The interactive whiteboard is a relatively new technology in Australian classrooms, especially in early years settings. This article reports on a case study in which an interactive whiteboard was placed in a Prep (Year 0) classroom in a Melbourne primary school. The teacher was then observed by making both audio and video recordings to watch for adaptations of her pedagogical style and consequent enhancements to learning as a result of the insertion of the technology. She was observed to tighten her control of the learning situation in the early stages until the researchers intervened with a team teaching session, at which point she dramatically loosened her style to cede some of the control to the students. In the process a number of aspects of the use of the interactive whiteboard with young children were observed that suggest that this technology is of considerable value to enhancing early years teaching when the pedagogical style is matched to the affordances of the board.

INTRODUCTION

Interactive whiteboard technologies:

Becta (2004: 2), in its role as an advisory body in educational technologies for British schools, writes of the integration of interactive whiteboards into the classroom as an exciting new development that “challenges assumptions on the role of technology in learning”. The study reported here examines those assumptions and, in particular, the impact of the technology on the pedagogical practices of a teacher in an early years classroom together with how this impact may enhance learning.

Interactive whiteboards have made a very rapid penetration into Australian schools from 2003, with both secondary and primary schools installing them in teaching classrooms. Prior to that, while some Australian schools had accepted them as a core teaching technology (for an example of an early Australian adopter, see Lee & Boyle, 2003), it was the United Kingdom that had installed them widely throughout the school system. In the United Kingdom, the technology has been widely adopted over the past ten years, with the English Department for Education and Skills allotting over 50 million pounds to install interactive whiteboards in schools (Hall & Higgins 2005:13) and the Welsh Assembly allocating ten million pounds (Kennewell & Morgan 2003). In Australia, interactive whiteboard technology was watched from afar, possibly because the numbers of individual classroom computers has thrown a greater emphasis on technology for small group work. Partly due to the emergence of appropriate software such as Easiteach, interactive whiteboards have now begun to penetrate Australian schools. This has given researchers the opportunity to set up projects to observe the initial impacts of a previously little-used

technology. However, while there are no official figures available at present to show this, reports emerging from student teachers visiting primary schools, and from education officials is suggesting that in Victoria, at least, the boards are only rarely installed in early years classrooms. This is despite the technology having obvious potential for early literacy and numeracy teaching, as suggested later.

The interactive whiteboard is a large screen with a sensitive surface that allows the user to interact with a computer through a computer screen image. It is, in effect, a huge mouse pad. The image displays on the interactive whiteboard via a data projector. Depending on the make of board, the control of the computer can be undertaken from the interactive whiteboard with a stylus, pen or finger – or, as in the case of the classroom studied here, by a “magic” sparkly wand made by the teacher, Sue.

Research into interactive whiteboard use in primary classrooms

Despite the number of years of implementation in the U.K., research on the impacts of interactive whiteboards on pedagogy and learning has only recently begun to emerge. Cogill (2002 :7) lamented that there was little published research literature on the use of this new technology in schools, while there is ample literature of the “good practice” variety on ways to use the technology, much of it summarized by Becta (2004). Armstrong et al. (2005 :458) also commented on the dearth of research: “We chose from the outset to focus on the use of the interactive whiteboard in the classroom, as there was very little research on the use of this new digital technology from the perspective of teaching and learning”. Even when research has been undertaken, as a meta-study by Smith, Higgins, Wall & Miller (2005) points out, “evidence is usually in the form of interviews, surveys and questionnaires relating to teachers’ and pupils’ perceptions of IWB use”. They suggest that classroom observations may be needed. Miller and Glover (2002) undertook a study of five UK primary schools with established

installation of the boards, two schools with boards in each classroom, and three with a limited number and access. Their study was mainly by questionnaire and structured interview, with a small observational element. Their findings included claims from teachers from the interactive whiteboard-rich schools that pedagogy changed, although the changes were not greatly analysed, nor were they observed directly. What was made abundantly clear in Miller and Glover's study is that change depended on other factors as well as the boards. In particular, there had to be a will to develop and use the technology; there had to be a willingness for teachers to become mutually interdependent in development of materials, and there had to be changes in thinking about the way classroom activities were resourced (p.18). Hall & Higgins (2005) studied children's attitudes and perceptions about IWBs, using some observations, but mainly focus group interviews. They concluded that student interaction was a vital part of effective IWB use, but teachers often override student participation because it is time-consuming, while Kennewell & Morgan assessed student teacher attitudes and perceptions of IWB use in Welsh classrooms. One study that has used direct observation has been reported by Beauchamp (2004). In the process of directly observing classes where IWBs had been installed, he realised he needed an effective framework for defining stages of pedagogical activity and set out to create one. The study in a primary school with a large number of boards suggested very few teachers moved beyond what he styled as the substitutional and apprentice stages, but in a paper that concentrates on the establishment of a framework of the teaching styles, Beauchamp did not at this stage offer reasons for this.

Even with the research that exists, hardly any of it has been with early years. Yet the interactive whiteboard has features that seem to be particularly appropriate for the early years. The tactile nature of operation by finger (or wand) power, the large size of letters and images and the screen, the potential for one-to-one correspondence between symbol, image and sound (at least using the specialist interactive whiteboard software, such as), the ability to move and manipulate all screen objects with finger or stylus, would all appear to have important synergies for the early years teacher, especially with literacy and numeracy. The correspondence between sound, symbol and image was a feature of the software that was in use with the observed board in the study reported here. The software used digitized speech so that as letters, words and linguistic chunks such as phrases and sentences were written, either with an on-screen keyboard, or handwritten and converted to printed text, the board (in reality the computer) spoke the sounds. If it recognised a word in its dictionary, it spoke it correctly, and if the letters made a part word, or, either through mis-spelling or through choice of an unusual word, the computer does not recognise the word, the computer used phonetic rules to speak. It also recognised and spoke numbers correctly.

Pedagogical Framing

Bernstein (1990) proposed a continuum of teaching styles which he categorised as 'pedagogical framing'. Although Bernstein wrote of two polar states, 'strong' and 'weak' framing, this study has assumed that teachers occupy

positions along the continuum from strong to weak framing. In a strong framed pedagogy, the teacher controls the actions in the classroom, including the content, the delivery, the classroom arrangements, the uses of technology, even personal appearance (Bernstein, 1990 p. 37). In a weak framed pedagogy, the teacher shares the learning with the students, ceding some control of the learning environment in order for the students to be active participants in the learning experience. Rules are implicit, and the teacher acts directly on the context of acquisition but indirectly on the acquirer. By using Bernstein's features of each framing style, it is possible to locate a teacher's style on the continuum, albeit approximately, given the subjectivity with which assessments of framing strength will necessarily be made.

THE STUDY

A small research project was set up in a Prep (year 0) class in a Melbourne primary school in which the teacher (Sue) had agreed for the researchers to observe her regularly over a period of five months. A supplier of interactive whiteboard hardware and software gave a loan of a Teamboard for six months, and undertook to train Sue, the class teacher, with a half-day professional development workshop. The project originally set up the research observations to ask the question: *What is the impact on pedagogic practice when an innovative technology is introduced into a classroom?* However, many of the observations made here relate to learning and student reactions to the interactive whiteboard as well as pedagogy. The study looked at the technology as an innovation with a teacher who was open to new ideas. Unlike the Miller and Glover (2002) study reported previously, the primary data source was observational. Audio- and video- recordings of classroom lessons, followed by semi-structured interviews stimulated by information from the lesson recordings were the primary data collection sources. Sue, the research subject, was observed once a week over a five month period, and, as described later, the researchers intervened to team-teach and mentor her on one occasion. The video-recordings were coded for lesson events that related to the style of teaching. Sue was interviewed twice during the research period of five months, once early in the project when she had had the board for four weeks, and once at the end. The edited events from the videos and researcher observations supplied stimulus for these interviews.

Thus elements of change that occurred with the interactive whiteboard were analysed from the coding of video-recorded lessons. The video camera was set up in an unobtrusive position at the rear of the class and

allowed to run with little intervention. It was only focussed on the board. In this way the class, as is the way with young children, rapidly accepted the camera and research assistant as part of the routine, and from the second and subsequent visits showed little interest in the action taking place. Thus the lessons viewed, and the research, became largely naturalistic.

Observing the pedagogies

In this case, in visits to the school prior to the installation of the IWB Sue was observed to be a flexible teacher who regularly modified carefully planned lessons to take advantage of serendipitous learning events. She regularly involved her young students in decision making and problem solving about events in the school day and in the learning situation. Sue was considered to be positioned towards the weak framing area of the continuum.

It was with some surprise, therefore, that in early observations after the IWB was installed, Sue was observed to change her teaching style to impose strong control, and to close down opportunities for the children to contribute. She moved substantially to the 'strong framing' end of the continuum while using the technology, even though in the rest of her teaching she exercised weak framing. She controlled the early use of the IWB from directly in front of the board. In an example from an early video-recording of a literacy block session she is using the speech bubble option from the 2Simple software "2Publish" to invite writing ideas (Figure 1):

Sue: And what do you think we are going to write in these speech bubbles?

James: We might write people speaking and write what they are saying.

Sue: I think that's an amazing idea, I think we could have a go at doing that today. There's something that we do need to remember. For example if we had a picture of – let me see –

James: A rocket

Sue: A witch

Sue overrode the idea that James suggested. It was clear Sue had a strict agenda, and the class "discussion" continued for some time until she had extracted from them what she considered the important things to remember. In this particular lesson this happened five times. Her body position was significant. She directed from the board, even when the children came up to the board.

The IWB seemed to have altered her pedagogical style in the opposite way to that claimed by proponents of the IWB. The technology was rarely necessary for what Sue wanted to teach. It was mainly being used as a substitution for older technologies such as

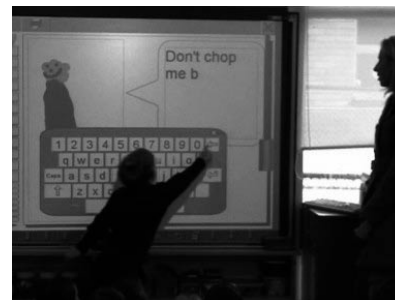


Figure 1. Working with 2Publish on the interactive whiteboard.

conventional whiteboards, flash cards etc.

At the six week point of the investigation, it was clear that the board had made little impact on the pedagogies of the classroom, despite the fact that Sue's skills with the board were growing. Her use of the board with the children had tightened her control over both the content and the pedagogical strategies. In an interview taken at this stage, Sue had admitted that she felt intimidated by the board.

And having a class it is a little bit different because you have to jump in at the deep end basically and to be up to speed with it quite quickly because you don't want the kids to be off – out of focus or – I don't want them to sit there and be fidgety while I'm trying to work it out. So I think it's been more about that fear of letting go and also looking silly in front of the kids because I really don't know what I am doing.

Mentoring the teacher and subsequent changes in pedagogical practice

In view of the reflective insights obtained from the first interview (excerpt above), the researcher and a research assistant (both experienced teachers), asked Sue if she would be willing to work together with them for a team-teaching afternoon to explore some of the capabilities of the board. In effect, the researchers became mentors. Sue readily agreed and as the three of us explored many ideas it became apparent that Sue was relaxing, especially as she began to realise that the children already had many of the answers to usage issues that had been inhibiting her. At the same time Sue was introduced to 2Create-a-Story, a multimodal writing application designed for young children to make narratives with words, images, sounds, music and animations.

Soon after the team teaching situation, Sue was video-recorded as she initiated a cooperative writing lesson. The class was invited to sit on the floor near the interactive whiteboard, and Sue started the software 2Create-a-Story. In this application, the user can both create images and write text, but in addition they can add sound effects (from a library, from imported files, by recording directly to the screen, or by using an on-screen music keyboard). At the same time Easiteach was run in 'glass mode' allowing some of its features such as small on-screen keyboard and capture of onscreen images to be accessed. Animations can also be added to 2Create a Story from a library of devices. The aim of the lesson was to build a

shared narrative through the board, which could then be saved and taken further as occasion arose. This was possible because the software allows multiple pages to be constructed, and the narrative can then run as a multi-screen book.

The video-recording highlighted how Sue had retreated from her dominant position by the board, but was sitting some distance away. She had relaxed many of the controls that she had previously imposed, and was allowing the children to develop their own cooperative writing and drawing ideas. However, what was perhaps unexpected was the flowering of creativity by the students as they worked with the interactive whiteboard in such lessons. It was as if by stepping away from the board, Sue had opened a gate. The creativity came multimodally, as children added text, drawings, movement and sound. It is, of course difficult to ascertain the various contributions to this creativity, for the affordances of the board and the multimodal nature of the software, as well as the weaker pedagogical framing displayed by the teacher were no doubt interacting. There is some evidence from other studies that multimodal technology environments can release great creativity in some children, especially when the pedagogic framing is weakened. Vincent (2004, 2006) found that certain children, usually ones that struggled with communication in words, found the availability of multiple modes of representation allowed them to communicate creatively in multimedia, and Beavis (2001) found the same in a project to make multimodal games. In such studies it was only a proportion of the children who responded in this way. In the present case, however, creativity seemed to come from a shared experience of narrative by the whole class building with the multiple modes provided by the interactive whiteboard.

Thus the capabilities of the technology for sharing understandings through the large screen, and the abilities of the software to create shared narratives, were built into the lesson planning. Sue was observed building in to the lessons the possibilities of flexibility, of lesson directions moving into places she had not planned. This suggests that Sue was accepting the technology into her pedagogy, and allowing it to promote ideas for shared understanding. As the lesson developed, it was clear that Sue had a very light hand on the tiller, and was prepared to allow the students to take control of the narrative building. She sat at the side, well away from the board, and invited children to come up to the board and develop narrative ideas. Because of the size of the board, each idea was then shared and meaning was constructed by each individual.

Although much control of this process was ceded to the children, this did not mean that overall control was lost. At strategic points, Sue would insert a guiding direction, a teaching point about a word, a sound, a spelling, some point of meaning, or a correction, but she allowed the narrative to be driven by the children. If there was a problem with the sound of a word, the child would listen, and then pick up a Thrass chart to check word families, sometimes with a slight prompt from Sue, sometimes quite

spontaneously using a multimodal approach to word finding. At the end, the written story that resulted, and all the images the children had contributed, were repeated and discussed as Sue asked the children to reflect and review their construction.

Among the other filmed lessons, Sue was observed using the *Easiteach* software with both literacy and numeracy teaching, enabling the children to both hear and see the symbols as they were produced on the interactive whiteboard. She used the *2Graph* for cooperative development of a data unit in which the children constructed the survey and discussed the results through a communal construction of the graph on the IWB. On a whole school cross-age mathematics day, she invited each group that visited her class to record the event on the IWB.

Sue herself reflected on the way that the interactive whiteboard had altered classroom dynamics and in particular, the interest and attention level of some of her students:

Int. You've talked about how you suddenly realised the children could take over and so on. Has that changed their relationship with you?

Sue: *It's probably let them gain a little bit more respect I suppose, knowing that teachers don't know everything. You know, knowing "well we are students but we can come to school to help our teacher out. We're not just here to sit and listen. We're actually part of this class. We're here to help [the teacher] out as well"*

Int: Does that relate to all the children/ Or are there certain children that it particularly relates to?

Sue: *No I found it with all of them. But even more so with the children that often wouldn't put their hands up. The children that were even sometimes disruptive. They were even more eager to assist with the problem solving and in turn they would sit still for a longer period of time. Their attention was focussed in a particular area or in a responsible way. They were just more engaged. Maybe they even felt a bit more important. Maybe even a bit more grown up. You know how sometimes kids get that image of the teacher, well that's the teacher and you sit and you listen, we're the kids. It's more of a team. You're working as a team to create a page or to create an idea and to work through any problems. It's not so much of a hierarchy.*

A key observation here is that the change from use of the board in a substitutional way to a very interactive

and student inclusive mode was intimately connected with the pedagogical framing of the teacher. Until the framing change took place, the many affordances of the board and its software were largely dormant. However, when the framing change took place, it became apparent that the IWB held some very powerful possibilities in the early years' classroom that were not being realised before the change. Some of the new impacts noted were:

The clear correspondence between image, symbol and sound can be a powerful aid to learning

Correspondence of sound, symbol and image

In both literacy and numeracy areas, the clear correspondence between image, symbol and sound can be a powerful aid to learning if harnessed effectively by the teacher. This became clear when Sue worked with small groups during literacy blocks and she had the digital voice switched on. On several occasions the video recordings showed her interacting with the children as they listened to the words they had written on the interactive whiteboard and then used their Thrass charts to find the word families that corresponded to the sound that they sought or heard. Before long, the children were observed fetching the Thrass charts with no teacher intervention as soon as they needed to check word families against the sounds.

Shared cognition

The interactive whiteboard allowed shared cognition in a way that is very hard to manufacture in the classroom without such a device. Once an idea or object is on the interactive whiteboard it is in the public domain. There can be no private knowledge once it is in front of the class. Children shared ideas that were then appropriated and built on by other children and the teacher, and this could be clearly observed. The key factors identified by Sue on several occasions during the interviews were the sheer size of the interactive whiteboard that allowed all children to see and share contributions by others, and the attraction the visual nature of the board contents for many children. A bigger research project than this might be able to test these claims of shared cognition by designing them into the project. We were not quite expecting this obvious cognitive sharing, and observed it incidentally as part of the video data, but Sue in interview was convinced she regularly saw sharing of ideas, and personal construction and interpretation of knowledge as other children used the board.

Children as agents

The children became aware that they were important agents in their own learning. This is recognised by Sue in the interview statement (above) "It's more of a team". She talked in interview fragment about the respect the children gained by realising that they had a contribution to make through the board.

Involvement

Sue said several times in interview how surprised she was that children who normally reacted neutrally or negatively to class activities or group activities, or children who formerly withdrew from classroom activities, became active and contributive. In interview she comments on one child:

Oh especially one little boy. Prior to the whiteboard, he was very timid, but you could see the amount of pressure he put on himself, but just giving him the opportunity to come up to the whiteboard and show – because he is a very creative boy, very hands on, and not necessarily the sit down, learn something type, his confidence has sky-rocketed, because he's been able to show the other children.

It appears that some aspect of the interactive whiteboard is captivating the interest of children who are not normally greatly involved in class activity. This aspect has been widely reported by others (e.g. Miller & Glover, 2002, Cogill, 2002, Becta 2004) As commented earlier, Sue suggests it is a combination of the visual impact of the software used plus the size of the board. A further observation, again from the video recordings, is that the tactile or kinaesthetic nature of the interactive whiteboard interface might make a contribution to understanding this phenomenon. Throughout the time it was switched on, children were constantly going up to it to touch it. At first it was thought that this might be a novelty effect, but six months after the installation it was still happening.

Motivation

Sue comments in the interview fragment above about the overall motivational nature of the interactive whiteboard. Again that has been commented on by other authors (Miller & Glover 2002, Becta 2004, Armstrong et al. 2005) but we have to be careful to distinguish between short term novelty effects, and longer term motivation due to other factors such as direct involvement in the learning process, the visual nature of the software used. However, some of the writings from the United Kingdom, where interactive whiteboards have been in use for as up to ten years in schools, are suggesting that this motivational factor is long-term when the interactive whiteboard is used. Miller and Glover (2002 :13) comment that there was no sign of this motivational impetus disappearing in the primary schools they studied. On the contrary, in classrooms where the system was in full use as a classroom resource in every lesson, children no longer saw it as a novelty but rather as an entitlement and were constantly motivated by it.

CONCLUSION

Few, if any, researchers have observed loosening of control to be a universal effect of the interactive whiteboard (for example, Beauchamp, 2004; Armstrong et al., 2005; Smith et al., 2005). In fact most observe that very few teachers seem to permit themselves to cede any control of the board. In this current study, despite the tendency in the non-interactive whiteboard classroom to weaken the control framing, it is an open question whether Sue's behaviour with the board would have happened without deliberate intervention before frustration set in, and we will never know because there was no going back later in the project. However, once it happened, Sue showed how interactive whiteboards may have powerful synergies in the teaching of early years students.

Where many interactive whiteboard studies have relied on observation at a distance through teacher reflection, questionnaires and interviews, this small study sought to enter into the classroom environment and observe directly. As a result the changes in pedagogic practice, both strengthening and subsequent weakening of the pedagogic framing, were observed at first hand, and appeared to be intimately connected with the mentoring undertaken, combined with the introduction of new software and the affordances of the board. The combined result of these factors was a radical change in pedagogical practice. Many details emerged which even surprised the teacher, and the insights described here can only be but a fraction of what was observed. There is a need to explore the importance of strategic mentoring, such as the team teaching afternoon in this case, in developing teachers' pedagogic stages of development. There is a need to understand such pedagogic behaviours to ensure that technologies are successfully integrated into the classroom to enhance teaching and learning. There is a need to comprehend the inhibiting factors that not only prevent technologies from helping the teacher improve teaching and learning, but, as in this case, can have a negative effect. It will be important to expand this kind of rich observational data into a much larger scale study so that we can come to know how best to implement such technologies, both in the present and in the future.

BIOGRAPHY

Following 40 years of teaching in primary and secondary schools, JOHN VINCENT is now teaching in the area of computers in education at the University of Melbourne and is conducting research on the assessment of multimedia and the use of interactive whiteboards in early years classrooms. jtv@unimelb.edu.au

REFERENCES

- Armstrong, V., Barnes, S., Sutherland, R., Curran, S., Mills, S., and Thompson, I. (2005). Collaborative research methodology for investigating teaching and learning: the use of the interactive whiteboard technology. *Educational Review*, 57, 4. pp. 457-469.
- Beauchamp, G (2004). Teacher use of the interactive whiteboard in primary schools: towards an effective framework. *Technology, Pedagogy and Education*, 13, 3 327-347.
- Beavis, C. (2001). Digital culture, digital literacies: Expanding notions of text. In C. Durrant & C. Beavis (Eds.), *P(ICT)ures of English: Teachers, learners and technology* (pp. 145–161). Adelaide: Australian Association of Teachers of English / Wakefield Press.
- Becta (2004). *Getting the most from your interactive whiteboard*. Coventry: British Educational Communications and Technology Agency.
- Bernstein, B. (1990). *The structuring of pedagogic discourse, Volume IV: Class codes and control*. London: Routledge
- Cogill, J. (2002). How is the interactive whiteboard being used in the primary school and how does this affect teachers and teaching?. Becta research papers. On-line www.virtualllearning.org.uk/whiteboards/IFS_interactive_in_the_primary_school.pdf Accessed 12/01/2006
- Hall, I. and Higgins, S. (2005). Primary school students' perceptions of interactive whiteboards. *Journal of Computer Assisted Learning*, 21, 2. 102-117.
- Kennewell, S. & Morgan, A. (2003). Student teachers' experiences and attitudes towards using interactive whiteboards in the teaching and learning of young children. In: *Young Children and Learning Technologies*, proceedings of the IFIP working group 3.5. Canberra: Australian Computer Society.
- Lee, M. and Boyle, M. (2003). *Educational effects and implications of the interactive whiteboard strategy of Richardson Primary School – a brief review*. On-line, www.richardsonps.act.edu.au/RichardsonReview_Grey.pdf Accessed 18/04/2006
- Miller, D. & Glover, D. (2002). The interactive whiteboard as a force for pedagogic change: The experience of five elementary schools in an English education authority. *Information Technology in Childhood Annual*, pp. 5 – 19.
- Smith, H., Higgins, S., Wall, K., & Miller, J. (2005). Interactive whiteboards: boon or bandwagon? A critical review of the literature. *Journal of Computer Assisted Learning*, 21 91-101.
- Vincent, J. (2004). *Computer mediated multimodal text production: Ten-year-olds crossing semiotic boundaries*. Unpublished thesis, University of Melbourne.
- Vincent, J. (2006). Children writing: Multimodality and assessment in the writing classroom. *Literacy* 40, 1 51-57