

## **Interactive Whiteboards and the First Year Experience: Integrating IWBs into Pre-service Teacher Education**

Chris Campbell

The University of Notre Dame Australia

Dona Martin

La Trobe University

*Abstract: The focus of this paper is on how pre-service teachers investigate using interactive whiteboards (IWBs) to incorporate e-teaching into their lessons. Digital convergence in the classroom makes technology an integral part of teaching rather than an add-on feature (Kent, 2004a, 2004b). To establish a context for the use of IWB in schools, the paper first examines relevant literature on IWBs. It then describes a program designed to link knowledge gained in a first-semester Information and Communication Technology (ICT) unit of a first year pre-service teacher undergraduate course with the practical use of IWBs in a mathematics education unit, Working Mathematically, in second semester. During this transfer of knowledge, pre-service teachers also explore the pedagogical implications of using IWBs in the classroom.*

### **Introduction**

Today, most Australian schools have at least one interactive whiteboard (IWB). Indeed, many have whole-school implementation programs, whereby IWBs are integrated into everyday classroom teacher practice (Zevenbergen & Lerman, 2008). IWBs have the ability to transform the way teachers use technology in their classrooms (British Educational Communications and Technology Agency, 2003; Glover & Miller, 2001; Glover, Miller, Averis, & Door, 2007). They provide ways of incorporating e-teaching into lessons by allowing digital convergence; technology is no longer an add-on feature but an integral part of classroom teaching (Kent, 2004a, 2004b).

It is important for teacher educators to introduce developing teachers to this still relatively new technology to ensure that they not only become more conversant with the technology but also are alert as to how IWBs can influence their pedagogical practices.

This discussion paper describes one university's attempt to challenge first year pre-service teachers to become comfortable with IWB technology and to consider the pedagogical implications of using it in their future classrooms.

### **Background**

Universities are grappling with the transformations required "to cope with the challenges and opportunities posed by information and communication technologies [ICT]" (Breen, Lindsay, Jenkins, & Smith, 2001, p. 95); one aspect of this relates to the use of IWBs.

IWBs are large, touch-sensitive boards connected to digital projectors and computers. Associated software provides a variety of functions described by Kennewell (2006, p. 2) as including:

*drag and drop (objects on the board can be moved around); hide and reveal; highlighting; animation; indefinite storage and quick retrieval of material and immediate feedback (when a particular object is touched, a visual or aural response is generated).*

IWBs “replicate the functions of older presentation technologies such as flipcharts, overhead and slide projectors and video players” (Schuck & Kearney, 2007, p. 8), but offer a more varied use of teaching materials, as they allow creative and dynamic integration of Web-based materials, rich media and manipulation of text and images. Information can be saved and printed directly from the board (Walker, 2002) and presenters have the opportunity to spontaneously and seamlessly access and annotate, if needed, a wide range of Web-based resources (Kennewell, 2001).

By offering useful ways for a class as a whole to interact with electronic content, IWBs provide versatility of learning for all ages and across all areas of the curriculum (Smith, 2000). According to the research by Levy (2002), IWB use increases the enjoyment and motivation of all classroom participants. Kennewell (2001) has also shown that students enjoy presenting and discussing their work via IWBs and that this sharing is a vital factor in increasing motivation and learning gains. Indeed, the UK government’s British Educational Communications and Technology Agency (BECTA), found heightened student motivation to be a key benefit of using IWBs (Schuck & Kearney, 2007).

Although the focus on motivational outcomes is well researched, it should be noted that a recent study by Swan, Schenker & Kratcoski (2008) found only small achievement increases in classes in which the teachers used IWBs. This is one of the few studies that demonstrate clearly any impact on student achievement from using IWBs in the classroom.

Despite being relatively easy to use, it is also important to note that there are issues associated with teachers using IWBs, including arranging for appropriate training and support, providing sufficient time for some staff to develop confidence in the technology and providing time to organise individual presentations.

Simply having a large electronic workspace does not necessarily open a lesson to higher student interaction. IWBs require an investment of time, as some degree of training and independent exploration by teachers is necessary before they are utilised effectively. In addition to feeling confident in using IWBs, users need to understand the technical issues; they need to be sure there is appropriate technical support and they need to have confidence in their network connections. Because IWBs are a relatively new resource, there is also a requirement for teachers to build up a range of multimedia teaching materials/resources and to understand that this process can be quite time consuming. Teachers may also become alert to the new level of presentation expectations engendered in students and the associated outcome of having to find ways to maintain this dynamic interaction. In addition to all this, it is important to note that while the interactive nature of the technology does allow for the development of engaging classroom activities, educators must also be alert to the impact the new learning/teaching medium has on a teacher’s pedagogy.

After all, planning and preparation of lessons is a key feature of a teacher’s pedagogy (Miller, Glover, & Averis, 2005). It is during this stage that teachers using IWBs need to be able to draw on and annotate a wide range of Web-based resources (Kennewell, 2001). It is also at this preparation stage that, dependent on subject and content, teachers can orchestrate faster-paced and more in-depth lessons (British Educational Communications and Technology Agency, 2003) and integrate ICT into their lessons so as to “harness the full potential of digital technology” (Schuck & Kearney, 2007, p. 13).

Teacher educators need to be aware of the need to integrate IWB technology into ICT classes early in teacher training and to ensure that pre-service teachers are alerted to the effects of this technology on their developing pedagogy.

The following section introduces the new 'first-year experience' program at La Trobe University, Victoria. Discussion then relates to how two teacher educators worked across the curriculum areas of ICT and mathematics education to provide pre-service teachers with an understanding of both the technological and pedagogical aspects of working with IWBs.

### **The first-year project**

As pointed out by Zevenbergen & Lerman (2008, p. 107), IWBs are 'an innovation that is gaining considerable presence in many contemporary classrooms'. With the increase in access to IWBs in schools comes the expectation that future teachers will be well versed in providing an efficient, effective and seamless integration of IWB technology into lessons across the curriculum. It must be noted, however, that users need training in how to use these tools, for, as discussed by Morgan (1994), tools by themselves will not transform pedagogy.

The present researchers worked with the full cohort of 212 first-year Bachelor of Education pre-service teachers to develop knowledge of and comfort in the use of IWBs. Their key aims were for these pre-service teachers to consider how they would incorporate this technology into their future classrooms and the pedagogical implications of their actions. The researchers were also the teacher educators: one taught ICT education (first semester) and the other mathematics education (second semester).

In 2008, the Faculty of Education at the University's Bendigo campus introduced the 'Connecting with Education: The First Year Experience' project. This project was initially conceptualised during a review of the BEd course in 2007. One aspect of the project was to 'embrace online teaching and learning mechanisms as an integral part of the teaching and learning program' (Masters, 2007, p. 2).

The Faculty had five IWBs (Activboards); three were placed in regular classrooms and the other two in the computer laboratories (PC and Apple). All rooms were deemed to offer the opportunity for high-volume usage. The three IWBs in the classrooms had software that enabled them to be used via laptops that were made available to pre-service teachers for class presentations.

### **First semester – ICT**

All Bachelor of Education pre-service teachers completed a unit of study that focused on ICT, called 'ICT for Education'.

The unit lecturer draws on constructivist theories of learning and teaching and believes that students learn through active engagement that includes experimentation and reflection.

Early in the semester, the learners' current knowledge was surveyed so future sessions could be conducted in such a way as to scaffold the students with prompts that would offer enough structure for them to understand the task and to feel confident to experiment actively in order to master the technical issues. The support was sufficiently open-ended to promote diverse outcomes. Indeed, the outcomes were expected to be unique and encompass a variety of pathways and products.

This unit provides pre-service teachers with up-to-date computing skills and introduces them to what to expect when teaching primary school students. It ensures that they

become familiar with various kinds of software: for example, PowerPoint, Photostory and Inspiration. In 2008, the pre-service teachers were invited to use IWBs for presentations and class activities across a range of subject areas. In the ICT unit the lecturer placed real emphasis on understanding of the technical aspects of using IWBs.

Lectures focused on the pre-service teachers becoming confident users of IWBs in the classroom. They were encouraged to understand how to use the associated technology and introduced to ways in which it could enhance learning in the classroom. Practical classroom examples were provided through ActivStudio and SMART Board Tools and through the Promethean Website. They were instructed in how to download existing flipcharts with a view to repurposing. They then created flipcharts that required ordering and sorting activities as described by Kent (2008). The flipcharts were discussed by the class when they shared the design strategies used in their creation.

Instructions on how to use the Smart Board Tools and ActivStudio were placed beside the IWBs and within the WebCT 6 Learning Management System (LMS). Those seeking more information were given links to various Websites. A WebCT discussion on interactive whiteboards was also created. In this space, the pre-service teachers were able to discuss their learning and comment on how they saw IWBs being used in different settings. They also had, as a part of their assessment, the opportunity to complete an assignment using the IWB software.

### ***Outcomes and evaluation***

The LMS discussion space was designed to encourage the pre-service teachers to reflect on their learning experiences through informal chats on various uses of the IWBs and to discuss how ICT was being used in schools across the region.

When using the space, they were expected to ground their reflection with reference to the textbook for the unit (Jonassen, Howland, Marra, & Crismond, 2008) and to comment on each other's experiences. This was done to promote thinking about how to align IWB use with current learning theory.

An analysis of postings revealed that there were few IWBs in the schools and that they were used infrequently, if at all:

- There are only two IWBs in the whole school.*
- To my knowledge there are no IWBs installed in classrooms.*
- Most classrooms had an IWB.*
- My school didn't have any IWBs at all.*

Other comments referred to the number of times IWBs were used:

- The students used the interactive whiteboard once while I was there.*
- The teachers used them different[ly] according to different Year levels.*
- My teacher heavily used the Internet through her interactive whiteboard.*

Comments also centred on the placement of these boards:

- The IWB that we used was in the next room so we moved into that room to complete a maths topic.*
- The only IWB was ... in the Year 5 classroom and other classes borrow this room for specific lessons.*
- There are IWBs installed in every classroom except for the Grade 5/6 classrooms.*

Some described the curriculum areas in which IWB technology was used:

- For prep maths the teacher set up a 1 to 20 number line and then pulled some numbers out so the students could take in turn and go up and put the numbers back in order.*

- *They looked at fractions.*
- *I ... saw ... math s used on the interactive whiteboard.*
- *The class I saw ... did ... literacy groups.*
- *During integrated studies the teacher used the IWB ...*
- *The IWB was ... used during a music lesson.*

These postings also elicited comments on teachers' proficiency with IWBs:

- *It amazed me to see that all students knew how to use the IWB and if the teacher was having trouble they all knew what to do most of the time.*
- *The teachers use the IWB to its full extent and put up all the content they want to teach to the students ... The teachers would use the interactive whiteboard to take attendance. ... Students ... fill in the missing words and brainstorm.*
- *I have been rather disappointed to see ... [that in] classrooms that do in fact have IWB s installed [they] ... do not seem to make much use for them, except for actually writing on.*

These comments display, to some degree, the extent of the implementation of IWBs in local schools. Of course there are many factors that influence implementation, including funding, where the IWBs are located physically and who in the school has access to them. Other factors involve a consideration of pedagogical issues, such a teacher's beliefs and how these affect the way the teacher values the IWB as a tool for providing enhanced learning opportunities.

While the focus in semester one was on developing confidence in the technology that supports the use of IWBs it was not until semester two that pedagogical issues were explored in any detail. The next section discusses how this exploration added to the pre-service teacher's developing knowledge base on how IWBs impact or are reflective of a teacher's pedagogy.

## **Second semester - mathematics education**

The researcher/lecturer in mathematics education subscribes to learning theories that promote the negotiated building of knowledge, whereby beliefs and understandings are reinforced as being vital to learner engagement and knowledge construction, and learning is seen as constituting a social activity.

The pre-service teachers were therefore expected to be active in organising their learning experiences in both social and cultural dimensions. The lecturer's personal philosophy and how it affected teaching and curriculum design was discussed openly with the first-year pre-service teachers. This candidness provided unique opportunities for the class as a whole to discuss pedagogical issues that supported and/or challenged the teacher's philosophical stance.

These discussions often focused on current research findings in mathematics education. For example, Zevenbergen & Lerman (2008) suggest that IWBs can offer a faster pace in numeracy lessons but they also maintain this quicker pace can have an impact on both learners and teachers. It may limit learners' opportunities to respond to questions or to discuss areas of uncertainty, while for teachers it can create a need for improved, sharper questioning skills to elicit understanding.

Other discussion opportunities related to the impact on the overall learning that occurred when the teacher assumed a position at the front of the class and was in charge of the IWB, and how this positioning affected the learning environment and perceptions of ownership of the learning.

Pre-service teachers were also alerted to the benefit of an IWB's visual presence and to the interactivity opportunities offered to the class. They were particularly involved in

discussing how beneficial the IWBs were in constructing and deconstructing mathematical equations and how useful this process could be in negotiating understandings.

They were directly challenged during classes to articulate what they considered to be the value of IWBs to their repertoire of teaching strategies. They were asked to investigate the value of building whole-class and small-group discussions around the activities on the IWB and, among other things, they were requested to include in each of the presentations they led a series of potential uses for the IWB.

These presentations required groups of three to present joint tutorials based on particular mathematical concept areas selected by the pre-service teachers during the first week of classes. They were directed to use the set text for the unit and provided with clear and direct links to a variety of Web addresses and resources. They were required to access these sites, as needed, find relevant information and use the IWBs to display this information during their presentations. A key aim was to have them display both technical competence with the IWBs and ways of creatively capturing the attention and imagination of class members by trying different questioning techniques throughout their presentations. They had to engage their peers in discussion about how the IWBs were used and how this use engaged the class and influenced their style of teaching.

### ***Outcomes and evaluation***

It was expected that by designing lessons around the IWBs, the pre-service teachers would begin to address what Glover and Miller (2001) identify as the three levels of whiteboard use:

1. teachers drawing upon a variety of ICT-based resources without disruption or loss of pace;
2. teachers extending learning, using more engaging materials to explain concepts; and
3. teachers creating new learning styles stimulated by interaction with the IWB.

In addition, the pre-service teachers were requested to focus specifically on how their use of IWBs affected collaborative group work and on their own styles of teaching.

Throughout the second semester, the pre-service teachers demonstrated a range of IWB adaptability. Some were keen to work with the IWB, to demonstrate how the knowledge gained in the first semester ICT unit and their experiences in schools supported the requirements of the second semester Working Mathematically unit.

However, despite providing multiple use options and offering clear directions for using IWBs in presentations, there remained an unexpectedly large proportion who, to varying degrees, avoided the use of the IWBs in their presentations. When challenged, they revealed not so much a lack of confidence in the technology but more a lack of confidence in how to use the IWBs in ways that would engage the whole class as active learners. They either used the IWBs simply as presentation tools (an outcome discussed in research by Armstrong, Barnes, Sutherland, Curran, Mills & Thompson (2005) as a clear hindrance to interactivity) or neglected to use the IWBs at all.

In addition, on the occasions that these more hesitant pre-service teachers did access the sites referred to via the IWB, they rarely engaged their peers in discussions about what was being displayed or made a serious attempt to manipulate the applications displayed.

For the majority who did incorporate IWB use, class work was engaging and informative. They openly discussed the problems they had encountered. For example, many relevant discussions on order and adaptability of delivery emerged when it was noted that the class discussion had moved away from the set presentation sequence.

Suggestions on anticipating where lessons might go, what were considered relevant educational tangents and how to pre-empt these tangents as future teachers were well aired.

As a result of these discussions, there was a clear flow of relevant information and a growing willingness to trial different ways of using the IWBs in a collaborative manner.

While not all the first year pre-service teachers were educationally ready for the depth of some of the pedagogically-focused discussions, they were aware that there was more to consider about IWBs than whether or not they were connected to computers and ready to use.

## Conclusion and recommendations

IWBs offer more to consider than simply new technology.

While they provide a means of introducing new learning opportunities, the technology must be supported from a pedagogical perspective. By being required to focus on pedagogical as well as technological issues, the pre-service teachers were quickly alerted to how using an IWB could reduce rates of interaction, increase perceptions of teacher control and speed up the pace of lessons - but require quality questioning from the teacher to ensure optimum learning opportunities were created.

As a consequence, there is a need for further research into how teacher educators can provide genuine opportunities for pre-service teachers to link technology and pedagogy.

IWBs offer dynamic opportunities to disseminate evolving content and provide relevant avenues to work with knowledge in contemporary situations. They have the potential to make a major impact on learning and teaching at all educational levels and educators across the various sectors must take every opportunity to not only use these flexible channels for information delivery but to further investigate just how IWB use affects all teaching and learning opportunities.

Pre-service teachers are the teachers of the future. As teacher educators, we must provide them with every opportunity to develop as teachers of quality.

## References

- Armstrong, V., Barnes, S., Sutherland, R., Curran, S., Mills, S., & Thompson, I. (2005). Collaborative research methodology for investigating teaching and learning: The use of interactive whiteboard technology. *Educational Review*, 57(4), 457 - 469.
- Breen, R., Lindsay, R., Jenkins, A., & Smith, P. (2001). The role of information and communication technologies in a university learning environment. *Studies in Higher Education*, 26(1), 95 - 114.
- British Educational Communications and Technology Agency (2003). *What research says about interactive whiteboards* (Report). Coventry, UK: BECTA.
- Glover, D., & Miller, D. (2001). Running with technology: The pedagogic impact of the large-scale introduction of interactive whiteboards in one secondary school. *Technology, Pedagogy and Education*, 10(3), 257 - 278.
- Glover, D., Miller, D., Averis, D., & Door, V. (2007). The evolution of an effective pedagogy for teachers using the interactive whiteboard in mathematics and modern languages: An empirical analysis from the secondary sector. *Learning, Media and Technology*, 32(1), 5 - 20.
- Jonassen, D. H., Howland, J., Marra, R. M., & Crismond, D. (2008). *Meaningful learning with technology* (3rd ed.). New Jersey: Pearson.

- Kennewell, S. (2001). Interactive whiteboards - yet another solution looking for a problem to solve? *Information Technology in Teacher Education*, 39(Autumn), 3 - 6.
- Kennewell, S. (2006). *Reflections on the interactive whiteboard phenomenon: A synthesis of research from the UK*. Paper presented at the Australian Association for Research in Education Conference, 26-30 November, Adelaide, Australia.
- Kent, P. (2004a). *e-teaching - the elusive promise*. Paper presented at the Society for Information Technology and Teacher Education International Conference 2004, Atlanta, GA, USA.
- Kent, P. (2004b, 6-8 July, 2004). *e-teaching and interactive whiteboards: Technology used to enhance effective pedagogy - creating a significant impact on classroom practice and student learning*. Paper presented at the Australian Computers in Education Conference, Adelaide.
- Kent, P. (2008). *Interactive whiteboards: A practical guide for primary teachers*. Sydney: Macmillian Education.
- Levy, P. (2002). Interactive whiteboards in learning and teaching in two Sheffield schools: A developmental study. Retrieved 23 November 2008, from <http://dis.shef.ac.uk/eirg/projects/wboards.htm>
- Masters, J. (2007). Connecting with education: The first year experience progress report. Unpublished report. Faculty of Education, La Trobe University.
- Miller, D. J., Glover, D., & Averis, D. (2005). Developing Pedagogic Skills for the Use of the Interactive Whiteboard in Mathematics. Retrieved 20 November 2009, from <http://www.keele.ac.uk/depts/ed/iaw/docs/BERA%20Paper%20Sep%202005.pdf>
- Morgan, C. (1994). The computer as catalyst in the mathematics classroom? In S. Lerman (Ed.), *Cultural perspectives of the mathematics classroom*. (pp. 115-131). Dordrecht, The Netherlands: Kluwer.
- Schuck, S., & Kearney, M. (2007). Exploring pedagogy with interactive whiteboards: A case study of six schools. Retrieved 19 November 2009, from <http://www.ed-dev.uts.edu.au/teachered/research/iwbproject/home.html>
- Smith, A. (2000). Interactive whiteboard evaluation. Retrieved 25th November, 2008, from <http://www.mirandanet.ac.uk/pubs/smartboards.htm>
- Swan, K., Schenker, J., & Kratcoski, A. (2008). *The effects of the use of interactive whiteboards on student achievement*. Paper presented at the World Conference on Educational Multimedia, Hypermedia and Telecommunications June 30 - July 4, Vienna.
- Walker, D. (2002, 13 September). White enlightening. *Times Educational Supplement*, p. 19.
- Zevenbergen, R., & Lerman, S. (2008). Learning environments using interactive whiteboards: New learning spaces or reproduction of old technologies? *Mathematics Education Research Journal*, 20(1), 107 - 125.