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# 1 Executive Summary

## 1.1 Overview of the study

This research project is the result of collaboration between researchers from the Faculty of Education, University of Technology, Sydney (UTS), the NSW Department of Education and Training (DET) and six DET schools. The project investigates the use of interactive whiteboards (IWBs) in K-12 pedagogy. Six case studies provide details of activities, approaches, roles and beliefs of students and teachers in a range of K-12 schools using this technology. A focus of the study is on the interactions between the new technology, pedagogy and the social conditions of the classroom. The findings aim to inform systems, teachers and teacher education institutions, about the pedagogical aspects of using IWBs.

The research project was designed and led by two UTS researchers, Associate Professor Sandy Schuck and Dr Matthew Kearney. They were assisted in the fine tuning of the research instruments and in data collection by two DET personnel. The project involved visits to the six case study schools by members of the research team. These visits ranged in duration from one to three days. Two researchers would participate in each visit, and data were collected by means of questionnaires, classroom observations, interviews with executive staff, participating teachers and other key staff, and focus groups with students.

Case studies were written by one of the researchers attached to that case and checked for accuracy by the other participating team member. The six case studies were then analysed for themes related to the research questions.

As well, an online survey was conducted by the DET's Centre for Learning Innovation (CLI) with participating teachers, who were members of an interactive whiteboard professional learning community. This survey probed Information and Communication Technology (ICT) use and in particular the use of IWBs by teachers in DET schools.

## 1.2 Research questions

This study focuses on pedagogy. It does not set out to examine the relative merits of different makes of IWBs, or to discuss the particular features of different IWBs. Indeed, the case study schools used different products. Rather it examines the nature of pedagogy in classrooms, where IWBs are being used, the rationales for and attitudes towards IWB use, and student perceptions of their use.

The research questions include:

- What do teachers and students see as the value of using interactive whiteboards in lesson designs and what beliefs do they hold about this technology and its relationship to learning and teaching?
- What is the role of the school in promoting use of the technology? What other contextual factors constrain or enhance the use of this technology in teaching and learning?
- What learning outcomes are supported by the use of interactive whiteboards in various Key Learning Areas? What learning tasks are associated with these outcomes?
- What pedagogical approaches are being used with this new technology?

### **1.3 Instruments utilised and developed for this study**

Instruments developed for this study were partially based on those used in the Schuck and Kearney study (2004) *Students in the director's seat: Teaching and learning across the school curriculum with student-generated video*.

The instruments comprised questionnaires for teachers and executive staff about their practice (see Appendix 1.1) which were amalgamated with interview schedules (Appendix 1.2) after case one to eliminate repetition of questions (Appendix 1.3), observation schedules (Appendix 1.4) and focus group interview schedules (Appendix 1.5).

Interviews and observations were semi-structured to allow the capture of relevant but extraneous data to that collected by the instruments. Observations included free-ranging observations and photographs were taken by one of the team members, of any relevant activity in the classroom. The instruments served more as a guide as to the type of questions we were investigating, and to ensure that researchers shared a certain level of consistency in their data collection.

As well an online survey was completed on the CLI Teaching and Learning Exchange site (TaLe), by members of a professional learning community on interactive whiteboards. Open-ended responses contributed to the findings section and the graphical data is found in the Appendix.

### **1.4 Scope of the study**

In this study, a range of expertise with IWBs was noted. Some schools had started using them just three weeks prior to our visits, others had been using them for three or four years. Consequently, in this study, the researchers are not looking at practice identified as exemplary but are considering examples of pedagogy using the technology with an understanding that the teachers are at very different stages of implementation and usage.

As well, it should be noted that the cases are all snapshots in time. The study is not investigating how practice with IWBs changes as teachers use the technology over an extended period. It is likely that as teachers become more familiar with IWBs they will investigate different uses of the boards, expand and extend practice and possibly change their practice. We are not making any comment about the likelihood of such changes, but are simply describing what was occurring at a particular moment in time in each of the six case schools.

### **1.5 Participating schools**

The six schools studied in this research project were nominated by the CLI. Colleagues at the CLI had identified schools in which there was extensive interest in the use of IWBs as well as a number of teachers actively using them in their classes. Additionally, we had requested that the suggested schools fall across a range of grades and curriculum areas. All of the schools were NSW DET schools.

Across these schools, students were interviewed or observed from a range of classes. These included: Kindergarten (K), Year 2, Year 4, Year 5, Year 6, year 7 PDHPE, year 9 Health, year 10 Business Studies, Year 11 Geography, year 11 Business Studies and Year 12 IPT. There was also one IO class and one multistage class in a one- teacher rural primary school.

Table 1.1 gives a summary of the schools that we included in the case study. (All names are pseudonyms to ensure confidentiality of participants).

Table 1.1: Participating schools

NSW DET primary school	-Ridges Public School (years K, 4 and 5) -Darcy P. S. (years 2, 4 and two year 5s) -Sheridan P.S. (year 6 and IO class) -Kirkland P.S. (one multistage primary class)
NSW DET high school	-Hidcote Girls High School (Years 7 PDHPE, 9 Health, 10 Business, 11 Geography) -Bayview Senior Secondary College (years 11 business studies, 12 IPT)

## **1.6 Key points from literature on interactive whiteboard use in classrooms**

A number of studies report significant teacher satisfaction with this technology. Many suggest that this is because the technology is well-suited to supporting whole class teaching (Kennewell, 2006). Others identify benefits of IWB usage including flexibility, efficiency, motivation and support of preparation (Smith et al., 2005). Ease of use is noted as a contributing factor to their popularity (Miller & Glover, cited in Kennewell, 2006). Teachers and students both suggest that there is an improvement in lessons in which IWBs are used (Higgins et al., 2005).

However, some researchers suggest that the technology is being used mainly to reinforce current teaching approaches (Hall & Higgins, 2005). Kennewell (2006) notes that the use of the IWB does not require any great changes from the mainstream teacher-directed approaches encouraged by the Department for Education and Skills (DfES, formerly the DfEE) in the UK, which encouraged teachers to use “direct teaching and questioning” of the whole class (DfEE, 1999). This finding is supported in a case study of one Australian school which suggests that the overall nature of classroom organisation is unchanged (Lee & Boyle, 2003).

While it appears that there are many benefits to classroom use of this technology, it is not yet clear how IWB use might affect learning outcomes or concept development. An important point noted by BECTA (2003) is that, as most of the research so far has been conducted in schools where the use of IWBs is very recent, further studies are needed to assess their impact once they are embedded in classroom practice (BECTA, 2003).

## **1.7 Key findings of this study**

The key findings of this project are summarised below. While many of the findings have been discussed in the literature, we believe that this study is one of the first to consider all the different aspects discussed below in a K-12 Australian context.

### **1.7.1 Teacher and student beliefs regarding the value of IWBs in the classroom**

Findings in this area were that teachers, students and school executive believed that the following were major benefits of IWBs:

- Facilitation of reflective practice (noted by school executives)
- Ease of use
- Discovery and learning of new skills
- Value as a catalyst for teacher learning
- The visual nature of the board
- Immediacy, flexibility and convenience
- Interactivity
- The match to students' digital culture

While it was clear that these reasons led to the use of IWBs in the classes observed, the researchers saw varying evidence of these outcomes actually occurring.

### **1.7.2 The role of the school and other contextual factors**

One of the strongest themes emerging from the study at the six school sites concerned the role of the school and the positive influence this could provide. The following aspects of the context were observed across all the schools:

- The presence of a principal with enthusiasm for this technology
- Interest of the students in the technology
- The school culture: this was seen to be a major factor which had a number of different characteristics, all seen to be influential in developing use of IWBs. These included:
  - an expectation that staff would use IWBs in their teaching
  - a supportive and open staff and parent culture
- Professional development on offer both by commercial IWB suppliers, and through support at the school. Such support was often instrumental in encouraging staff to explore options.
- Time as an important affordance – for teachers to develop their skills and familiarize themselves with this technology.

### **1.7.3 The learning outcomes of interactive whiteboard lessons**

A variety of learning outcomes were observed and others were discussed by teachers in their interviews but did not occur during our visits to the schools. Where learning outcomes were noted, these tended to be more a function of the lesson content than the technology used.

Some outcomes related to IWB use were observed by the research team. For example, students were generally on-task and motivated; lessons using the IWB were perceived by students as 'better than' other classroom work. Also, learners with special needs were generally engaged by this technology. However, higher-order thinking and clear learning outcomes were not highlighted in this study and it was not the purpose of the study to determine what role IWB use might have in promoting such outcomes.

### **1.7.4 Pedagogical approaches**

- Whole class interaction was the main pedagogical approach used
- Over forty different uses of IWBs were noted
- Dialogue was often authoritative and followed a traditional *Initiate-Respond-Evaluate* interaction mode (Mehan, 1979)

- Both students and teachers suggested a preference for this whole-class approach rather than collaborative small-group or pair approaches
- Pre-planned lessons were strongly supported by the technology and teachers used the boards to collect resources, plan whole lessons and store past lessons for future review
- Explicit teaching was prevalent.

### **1.8 IWBs and authentic learning**

Many teachers commented on the authenticity of the lessons mediated through IWB use. By authenticity they generally meant the access to resources that were current and from real-world applications, as well as the ability to bring rich media into the classroom task.

However, more complex tasks which required problem solving and authenticity were not evident. Observed lessons were generally highly structured and contained explicit instruction from the teacher, features not usually deemed to be present in authentic learning tasks, which are generally characterised by ill-defined, complex sub-tasks to be investigated over a period of time, with the opportunity to examine the task from different perspectives (Reeves, Herrington & Oliver, 2002).

### **1.9 The NSW Quality Teaching Framework**

Teachers commented on the way that the Quality Teaching Framework (QTF) used by many DET schools supported and underpinned their teaching with IWBs. As well, they felt that IWBs allowed many elements of the QTF to be realized. The elements of *connectedness* and *inclusivity* in the *significance* dimension were mentioned by a number of teachers. Students' access to relevant resources, contact with a technology that was in widespread use outside of the classroom and exposure to visually powerful media added to many elements of the quality learning environment dimension. Students were often the driving force in encouraging teachers to use IWBs in their lessons.

### **1.10 Summary and recommendations**

This project provides an in-depth view of the pedagogies, beliefs, approaches and school contexts that exist in classrooms with access to IWBs. While the study does not attempt to generalise its findings, there are many rich descriptions and insights that are afforded by the research. Most of these insights are not new, but the authors believe that it is the first time that they have been collected together in one study, located in Australia, and covering classes from K-12 in NSW and across diverse subject areas. We have found few other studies in the literature that have considered pedagogy, learning outcomes, teacher approaches and school contexts in one study and integrated these results.

Findings of significance were the following: IWBs fit well with most teachers', administrators' and students' views of classroom learning as whole-class, teacher-directed and resource-filled. For this reason, they enjoy enormous popularity. As well, they enhance engagement and learning through their ability to provide attractive visual presentations, connect to the 'outside world' and allow for careful preparation before the lessons. They also appear to encourage teachers to become

interested in computer technologies and provide a bridge into the digital world, for both teachers and students. They have a strength in maintaining the attention of students with special needs and are particularly valuable for lessons with such students.

However, this report raises the question of whether typical use of IWBs merely replicates old practices in technicolour or whether IWBs can be used for disrupting pedagogies and encouraging new ones. IWBs are easily used as “jet-powered stagecoaches” (Papert, 2004) and both familiarity and training are required for them to be used in pedagogically diverse ways. An important issue that we acknowledge is that IWBs are a fairly recent phenomenon in schools in NSW and expanded pedagogical practices may occur once IWB users become familiar with the technology.

Recommendations arising from this project are:

- Further research should be conducted in a number of areas, see section 1.11
- Professional development should focus on more than directions for use of the IWBs, but should include some provocative and innovative examples of learning with IWBs
- Teachers should be encouraged to share their resources and ideas through special interest groups within schools and beyond
- Principals and e-learning leaders should be supported in providing direction for staff as their vision is fundamental to the staff development in this area
- Technical support and easy access to equipment is fundamental.

### **1.11 Future directions for research**

There are a number of future directions that would be beneficial for research on IWB usage in classrooms. Some of these are noted below:

- How does pedagogy with IWBs change and develop over a period of time?
- How can pedagogies using IWBs be supported to develop into disruptive and emancipative ones that better promote learning?
- How can IWBs be used to create classrooms more dialogic in approach?
- How can teachers be supported to make pedagogical decisions about which technological tools to use at different times in their teaching?
- How are specific learning outcomes influenced by use of IWBs?

### **1.12 Conclusion**

Interactive whiteboards allow teachers to prepare lessons carefully and provide rich, colourful resources in their classrooms. Lessons can be stored for preview. Both students and teachers appear to enjoy the use of IWBs in their lessons and they appear likely to become highly popular technologies in classrooms.

While IWBs have a real value in gently bringing teachers into the digital world in a way that is non-threatening and unprovocative, the very fact that they often do not disrupt teachers’ and students’ views of learning may be a weakness as well as a strength. If teachers can be persuaded to consider ways of using IWBs to provide new ways of learning and teaching, they will become more valuable tools in the teaching repertoire.

The authors learned much from this project and wish to thank participating teachers and school leaders and students in the case schools, for their support for the project. The views expressed in this report are those of the researchers and do not necessarily reflect those of the funding bodies.

## 2 Literature Review

This section examines relevant literature on the use of interactive whiteboards in schools. Interactive whiteboards have been located in school classrooms in increasing numbers over the last five years. They are known by a variety of names such as electronic whiteboards, digital whiteboards, smartboards and interactive whiteboards. These names may well imply different things to different people; we are choosing to call them Interactive Whiteboards (IWBs). Software provided with IWBs provides a variety of functions such as “drag and drop (objects on the board can be moved around); hide and reveal; highlighting; animation; indefinite storage and quick retrieval of material; feedback (when a particular object is touched, a visual or aural response is generated).” (Kennewell, 2006, p.2). Additionally, the IWBs can replicate the functions of older presentation technologies such as flipcharts, overhead and slide projectors and video players.

As IWBs have been rolled out in schools in the UK, they have become increasingly popular. Most teachers using them are positive about their use and students seem to find the use motivating. Research evidence suggests that IWBs can enhance teaching and learning (BECTA, 2003). Kennewell, (2006) in a meta-analysis of research on interactive whiteboards, notes that unlike adoption of other ICT, interactive whiteboards have met with widespread interest and high rates of adoption in schools. However, he makes the point that despite the huge uptake of this technology, “To date, the top-down policy driven approach to pedagogical change, represented by the National Strategies in England, seems to have stalled at the stage of surface interactivity which is reflected in replicatory use of IWBs” (p. 7). Kennewell concludes by suggesting that there is a potential for IWBs to be more than a tool to support outmoded pedagogies.

The output of papers discussing teacher use of this technology is burgeoning. However, the literature on interactive whiteboards comes predominantly from research in the UK. In Australia, interactive whiteboards are a relatively new phenomenon and little formal research has been done on their use. The UK government has invested heavily in the installation of IWBs in schools with a view to impacting on teaching and learning (Clarke, 2004). In Australia, research recommendations will underpin decisions regarding large-scale support by Australian departments of education.

Overall, teachers who have been involved in studies and projects relating to the use of IWBs have commented positively on their impact (BECTA, 2003; Higgins et al., 2005). However, many of the discussions on IWB use in schools relate to teachers’ activities with the boards and are in the form of guides on how best to use IWBs effectively. Less research has been done concerning the way that teachers view this technology and their reasons for using it, their pedagogy or the learning outcomes that can be achieved through such use.

Common claims made by teachers and educational experts include enhanced student motivation and engagement; opportunities for enhanced interaction between teacher and student and between students; enhanced and more effective lesson preparation and technological skills. The overall benefits of whiteboards in terms of their interactive and collaborative nature also fit well in the context of extending and transforming teaching and learning to create a stimulating environment in the classroom.

These findings and others will be discussed in this chapter. We will analyse the research on use of IWBs in sections related to the research questions we pose in this study; these concern the views of the teachers towards, and their reasons for using the IWBs, the role of the school in promoting their use and the nature of the learning environments afforded by this technology.

## **2.1 *Enhancing motivation and other affective outcomes***

Increased motivation and engagement is one of the most heralded benefits reported in the literature discussing the use of interactive whiteboards. The British Educational Communications and Technology Agency (BECTA), the UK government's lead agency in this area, cites increased motivation as a key benefit of interactive whiteboards. The reasons for this arise from their 'presentational capabilities' (in terms of quality and the use of colour and movement, perhaps a mirror of students digital world), "incorporation of websites and video seamlessly into teaching, high level of interaction and the capacity to present and discuss students' work ..." (BECTA, 2003, p.3). In this regard, one of the important factors in increasing motivation and engagement is the affordance IWBs offer for students to use and interact with images or text that they might otherwise not have accessed (Kennewell, 2006). The motivational aspect of IWBs is also described by Blane (2003) when he examines them in the context of students in primary classrooms.

Students have also reported on the advantages of working with IWBs. For example, Hall and Higgins (2005) found year 6 students very enthusiastic about particular aspects such as versatility, multi-media capabilities and the fun and enjoyment IWBs brought to their learning. In another study involving Year 5 and 6 students in a UK school, students described 'how different elements of hardware and software motivate and aid in concentration' (Wall, Higgins & Smith, 2005). On the negative side, students in these studies indicate frustration when experiencing technical difficulties in using the board or when they are not allowed to use the technology themselves, in the classroom.

BECTA research (2003) also talks about the expectations that students have (regarding use of the whiteboard) and how this puts pressure on teachers in terms of the need to constantly improve the presentation and content of lessons. Motivational aspects of the boards, therefore, not only relate to students but also teachers, in the way the IWB motivates them to present lessons in a more visually stimulating and interactive way (Barry & Smith, 2005). Indeed, the multimedia and multi-sensory capacity of IWBs makes it possible to present stimulating media and this can enhance students' recall. Also, the facility to manipulate and professionally present information can enhance learning in the classroom (Bell, 2002; Levy, 2002; Thomas, 2003).

Finally, the versatility of the IWB makes it possible for it to cater for diverse groups of students with different backgrounds and learning styles (Bell, 2002). This in turn, increases motivation and enhances learning, as described by Clemens, Moore and Nelson (2001).

## **2.2 *Enhanced preparation and presentation of lessons***

Burden and Sietniekas (2004) investigated the impact of use of IWBs in the Westminster Education Action Zone, UK by considering their use in 11 schools. They

found that while teachers did not explicitly link the use of IWBs to their lesson plans, they were able to articulate reasons for using the boards that went beyond student motivation alone. Head teachers in this study suggested that the impact of the whiteboards was most positive in terms of the increased preparation that teachers were putting into their lessons. They felt that teachers were putting more time and planning into their lesson structure, in order to use the IWB effectively. An example of such planning is also noted by Kennewell (2004): files or pages can be prepared in advance and linked to other resources used in the lesson. Preparing lessons around a single file can assist teachers in their planning and flow as well as provide time for reflection after the lesson.

Teachers also commented that they were spending more time thinking about their students' individual learning styles and inclusion as a result of using the boards (Burden & Sietniekas, 2004). Teachers also valued the capacity to work in a non-linear way in their lessons. They were able to store resources on the IWB so that if a question arose spontaneously from a student, they would be able to respond as they had access to additional resources. This allowed them to react quickly in a more student-centred fashion than they might have in a similar lesson, without the IWB. Teachers valued the fact that they knew how to capitalise on serendipitous moments that occurred in the classroom, as they had thought about these moments during their preparation.

### ***2.3 Links between teachers' beliefs about teaching and learning and use of IWBs***

Teachers play critical roles in ensuring effective use of interactive whiteboards as pedagogical tools at all stages, from the introduction of IWBs into the classroom to their successful and effective usage by students and teachers. Research studies have focused either on the ability and willingness of the teachers to harness the full potential of the interactive whiteboard to gain desired outcomes, or the connection of IWB use with changes to teaching practices and to student learning. To this effect, teachers' own beliefs and understandings of students' learning, and how these interact with IWB use, are significant.

In school-based research involving eight teachers from five schools in the UK, Kershner and Warwick (2006) were interested in understanding what teachers value about learning and how this connects with their knowledge about the uses of IWBs. Teachers were asked to examine their own dialogue and interactions in the classroom thus providing a socio-cultural perspective. The researchers in this study coded and evaluated pupil-teacher talk as a way of analysing classroom interactions. They used a model that distinguishes an interactive/non-interactive dimension (associated with the extent to which students contribute to class discussion) from a dialogic/authoritative dimension (associated with the amount of teacher control of presentations and class knowledge production.) Their findings reported that the teachers facilitated the type of interactions that they valued and identified as associated with children's learning. In another study, highlighting teachers as critical agents in mediating and integrating IWBs into the subject's lesson aims, Armstrong, et al. (2005) noted the importance of the history of experiences that teachers and students bring to the classroom and which relate to their previous cultures of learning and tool use.

The importance of teachers' roles and their appreciation for the IWB is also highlighted in a New Zealand article by Love and Garcia (2004). On a similar note, the notion of whole-class teaching strategies and connectionist classrooms is discussed in a paper by Hughes and Longman (2005). They noted IWBs being used principally in a presentation mode and did not observe any teachers attempting to allow learners to "create their own models, frameworks, language and way of working" (p.11). They pointed out that teachers' beliefs about teaching were influential in their ability to fully orchestrate the affordances of the IWB. In summary, it can be concluded that teachers are powerful agents in the integration of IWBs in schools.

## **2.4 The role of the school in promoting use of IWBs**

Current literature on IWBs highlights the crucial role of schools and the need for the involvement of the whole school community to get the maximum benefit from IWB use. Peter Kent, the principal of Richardson High School in Canberra, has pioneered innovative use of the IWB in Australia over recent years (Kent, 2004). He stresses the importance of school leadership and the involvement of the entire school community. If teachers are to effectively use IWBs in the classroom, they require the support and encouragement of all school staff. Kent also reiterates the trust placed on the teachers as a key factor to the success of the IWB in the school. In noting the outcomes, he suggested that "Richardson is the first school in the ACT, and probably Australia, where the total school community - the students, staff and parents - has embraced a new approach to the use of ICT, which enhances the holistic education of students" (p.14).

The importance of whole-school culture in the context of expectations is also highlighted by Winzenried (2006) in his initial international study on the use of IWBs in schools. In general, whatever the expectations might be, he concludes from his study that IWB implementation is a whole-school issue and affects school culture and policies.

## **2.5 Contextual factors that support or constrain IWB use**

It can be safely concluded from the current research literature that a lot of factors play a crucial role in the success or failure of IWBs in schools. BECTA lists some critical factors for effective IWB use. Among these are provision of appropriate training, continued professional development and ongoing technical support to teachers and schools in general to meet their individual needs (Higgins et al., 2005; Winzenried, 2006). Indeed, many studies signal the crucial nature of professional development, highlighting *how* the teacher uses the IWB as being far more important than the nature of the technology.

Teachers need to be able to access IWBs regularly to gain confidence and embed their use in their teaching. Equally, it is important for teachers to invest time to become confident users and to build up resources (BECTA, 2003). The location of the IWB in the classroom is another factor that needs to be considered for its effective use.

From the practicality perspective, the needs and expectations of different schools also have to be taken into account as these are not always necessarily consistent and may vary from school to school (Winzenried, 2006). A key factor that

played an important role in the success of the Richardson High School IWB experience has been ‘integration’. In their report of the school’s experience, Lee and Boyle (2003) comment on how educational and administrative activities were successfully integrated into the whiteboard ‘deployment’, “while linking the whiteboard initiative with a range of other whole school development and teaching programs.” (p.3).

School leadership and a critical mass of staff support are some of the other factors that are mentioned in the literature review as either inhibiting or supporting the use of IWBs. Lee believes that for successful take-up of IWBs, strong leadership is critical (Lee, 2004). Teacher acceptance and adoption of the new technology is also a contributory factor, according to much of the literature from the UK and Australia (Armstrong et al., 2005; Levy, 2002).

## **2.6 *Learning outcomes of lessons that use IWBs***

There has not been sufficient evidence in the current literature to show links between IWB use and performance attainment of students, although their impact has been discussed more frequently in the mathematics and foreign languages domains (Gerard, Greene & Widener, 1999; Miller et al., 2005). While identifying ways in which IWBs can support the foreign language teaching process, Gerard et al. (1999) conclude that the IWB has much potential to enhance the learning processes in foreign languages lessons. Miller et al. (2005), in a report to BECTA on how to enhance teaching and learning through the use of IWBs in secondary school mathematics and foreign languages, concluded that teachers need to be able to reach the ‘enhanced interactive’ stage of development (i.e. have very good ICT skills and seek to use the technology as an integral part of the lessons) for IWBs to have a significant impact on teaching and learning outcomes. In a similar classroom-based study investigating student responses to the use of the IWB in mathematics lessons, Knight, Pennant and Piggott (2005) concluded that “whiteboards may have the ability to contribute to creating effective working conditions for learning that enhance general classroom practice.” (p.15)

Similar observations were made by Smith et al. (2005) based on a pilot project evaluation in the UK in primary schools. However, analysis of the attainment data of pupils in the IWB pilot schools found very little or no difference on national tests in mathematics and science. A critical review of the literature on IWBs by Higgins et al. (2005) also concluded that there does not appear to be any evidence linking increased pupil attainment with use of IWBs. As most of the research so far has been conducted in schools where the use of IWBs has only started recently, further studies especially those of a longitudinal nature, are needed to assess their impact once they are embedded in classroom practice (BECTA, 2003).

## **2.7 *Pedagogical approaches that are used with IWBs***

The type of pedagogical approach taken with respect to IWBs will largely depend on the attitude of teachers and how much they are willing to embed this technology in the classroom. Again, this will depend on how comfortable the teachers are in using IWBs and what level of support they are offered from the school community.

Miller et al. (2005) found planning and preparation by teachers to be the key feature in pedagogy. Teachers tended to plan for cognitive development, taking into account the needs of individual pupils and using a three-part lesson structure that provided activities to encourage a thinking approach. It is worth noting that the authors emphasise the need for teachers to be at an 'enhanced interactive level' and ready to integrate "concept and cognitive development in a way that exploits the interactive capacity of the technology" (p.4). Teacher effectiveness is therefore critical in bringing about changes and this has been aptly pointed out by Miller et al. in a literature survey of use of IWBs: "As teachers become more fluent in their use of technology and recognize the link to pedagogic change, the IWB becomes the focus of changed approaches" (p.7).

Other pedagogic approaches reported in studies show that teachers can draw on and annotate a wide range of web-based resources (Kennewell, 2001), can orchestrate faster-paced and more in-depth lessons (BECTA, 2003) and integrate ICT into their lessons so as to harness the full potential of digital technology (Kent, 2004; Smith, 2001).

The type of pedagogy and learning approach will also depend on the subject being taught and the ability of the teachers to identify subject-specific resources on the whiteboard that can enhance the work they are doing. For example, Kennewell (2004) suggests teachers can use whiteboard features such as 'cover and reveal' (in geography lessons) to encourage pupils into thinking about the lesson content by revealing each picture a little at a time. Another example would be to harness the dynamic nature of the whiteboards in starter activities and plenary sessions.

It is evident, from current research studies, that it is not yet clear whether and to what extent the use of IWBs can transform pedagogy in the classroom. While discussing this at a recent conference, Kennewell (2006) reinforced the role of teachers in orchestrating and bringing about changes in pedagogy. The role of IWBs in terms of their impact on pedagogy requires further investigation. For this reason, research groups focusing on the impact of IWBs on pedagogy have been set up in the UK (Kennewell, 2006).

## **2.8 *Implications of Findings from the Literature***

In summary, we have explored several potential benefits that have been reported in a number of school-based research projects, discussion papers and articles. In addition, we have also looked at some of the factors that play a part in the use of IWBs in schools. Interactive whiteboards are a relatively recent phenomenon, particularly in Australia, and more research needs to be done on all aspects of their use. Though there are benefits with respect to student motivation and engagement, there is a lack of evidence on the impact of IWBs on student achievement and performance outcomes. Current research studies, however, appear optimistic about the learning and pedagogic benefits and the ability of IWBs to improve the teaching and learning process in the classroom.

## **2.9 *Recommendations From The Literature***

Throughout the broad body of literature, there are predominant themes that emerge as needing further research. These recommendations for future research can be broadly categorised into: i) the role of teachers and their beliefs; ii) the impact of

IWBs on student learning and achievement; iii) evaluating the impact of IWBs across all curriculum areas; and iv) teacher rationales and student perceptions of IWBs, particularly in Australian school contexts.

Given the crucial role of teachers in the use of IWBs, research is needed to understand how teachers view this technology in terms of its use as a technological tool or a pedagogical tool. Understanding teachers' existing beliefs on traditional and new literacies and teaching practices will also provide insights into how they will view the IWB in the classroom. The context of whole-class teaching strategies or promoting teacher-led classrooms needs to be further explored particularly with respect to the interactive nature of the whiteboard.

Studies are needed that indicate key learning outcomes that are achievable through the use of IWBs. These can occur only after the IWB has been embedded in classroom practice for some time and is no longer perceived to be a novelty. As most of the current research has been conducted in schools where whiteboards are fairly new to both teachers and students, it will be also be useful to re-assess their overall impact and uses (not just their effect on student performance) as the technology becomes accepted and embedded into practice.

Further understanding students' perceptions on what they think and value about IWBs (e.g. see Hall and Higgins, 2005) is also helpful in understanding the overall issues surrounding this technology. Further, there is a need to evaluate the benefits of IWBs across all subject areas. Some research has been conducted on its impact on mathematics and languages but a more generic and subject-specific investigation into teaching practices using IWBs is required.

Finally, despite many school-based research projects, there is not a great deal of literature relating to IWBs in refereed academic journals. Many of the articles in educational publications tends to focus on anecdotal evidence. Further formal investigations are therefore needed to assess the wider applicability of IWBs (academic, social, technical, affective etc), including long term longitudinal studies.

This report will address many of these areas through its interpretation of findings from research in six case Australian schools. It examines teacher and student perceptions, learning outcomes and pedagogical approaches. Other areas cannot be investigated at this stage of relative newness of the technology in Australian schools.

## 3 Research Methodology and Design

### 3.1 Methodology

The study seeks to gain an understanding of the way that teachers and students interact and learn in classrooms in which practice using interactive whiteboards occurs. The focus of the study is on what happens when teachers in K-12 classrooms use this technology to develop their students' understanding of curriculum content. A qualitative research paradigm is used in this interpretive study (Erickson, 1986; Lincoln & Guba, 1985) to develop a deep understanding of these types of practices occurring in six case study classrooms.

The use of interactive whiteboards in Australian schools is a relatively new phenomenon. A few schools have been using them for up to four years but in many schools they have been taken up as a resource in the last two years. As this study was a collaboration with the NSW DET, only DET schools participated. Schools were selected for this study, firstly because the NSW DET had identified them as schools using interactive whiteboards for pedagogical reasons, and secondly because the schools themselves had expressed a willingness to participate. Schools were further selected so that there were both primary and secondary schools and a range of curriculum areas and pedagogical contexts for the use of the technology. Given this rationale for selection, the study was not necessarily looking at schools that were accomplished and experienced users of the technology, but rather ones that had access to the technology and were willing to participate in the project. Therefore, our schools varied in their experience with IWBs, and showed diversity in their usage, their confidence with the boards, and their expertise using them.

In each case study from our project, permission was obtained from the school, the DET, teachers, parents and students for researchers to observe and photograph aspects of lessons, and to use data collected in this way in our analysis of the study. The researchers also promised to maintain confidentiality of the students and other participants, and gave assurances that images of students or teachers would not be shown in any publications on the research in ways that might identify the participant, unless they had the participant's permission to do so.

The research team, comprising the authors of this report and two education officers from the Centre for Learning Innovation (CLI) at DET, visited schools in pairs. As well as data collected through the use of questionnaires (see Appendix 1.1), interviews (Appendix 1.2) and focus groups (Appendix 1.5), lessons related to the classes' use of interactive whiteboards were observed. Observations were based on an observation schedule the team had developed (see Appendix 1.4), but also focused on any interesting activities in which the students were engaged. One member of the team took photographs of the student activity and general classroom environment, while the other member of the team made field notes according to the observation schedule and supplemented these with relevant observations that had not been captured by the schedule. After the team had collected data at the first school, we decided to merge the questionnaire and interview schedule to cut down on participant response time (see Appendix 1.3). Participants chose whether to answer by questionnaire or interview, all choosing interview.

After the field trips for each case study were completed, the researchers who had been involved in the data collection at that school transcribed the data from notes and audio-tapes. These transcriptions were sent to all members of the team who had been researchers on that case study, for verification. In the case of disagreement, the

researchers revisited the raw data on the audio-tapes, photographs or observation notes. After all data from a case had been transcribed, a member of the research team took responsibility for writing up the case study. The case studies followed a template that the principal researchers had developed to capture the case of the first school visited. The template considered the data and categorised the findings into a number of areas that had been suggested by the research questions for the study. Additional discussion occurred as appropriate.

The next stage after all the case studies were complete, was to collaboratively consider the six cases and look for common trends, discrete differences and influences that might have caused these differences. This analysis followed the process described here: the two report authors initially collected the data from the cases and placed them into sections suggested by the research questions and then shared interpretations of the data, and their groupings into categories. These categories were then used to write the findings chapter, with findings grouped under various themes. The draft report was then shared with the DET researchers at CLI and discussed and modified as necessary. This analysis contributed to this final summative report.

This report is to be shared with the funding bodies (CLI at DET, DET Western Region and Electroboard Ltd), and also will be sent to each participating school and to the Strategic Research Directorate at DET.

### **3.2 TaLe survey**

As well as the data collection instruments used above, an online survey was set up by the CLI researchers through their TaLe website. The Teaching and Learning exchange (TaLe, found at [www.tale.edu.au](http://www.tale.edu.au)) is an education gateway developed and managed by the CLI. This resource collection has an online professional learning community (PLC) space for teachers to discuss ideas, view new resources and share experiences.

In December 2005 an interactive whiteboard PLC on TaLe was set up by a senior project officer in NSW DET; it included a link to a short survey on interactive whiteboards that could be accessed by all DET teachers (See Appendix 1.6). The survey had 15 Likert –scale questions as well as one open-ended section. It was designed collaboratively by the research team. Over a 12 month period the survey received 87 responses from teachers across NSW schools and TAFE colleges.

Teachers in DET were notified of the survey by a group email to ICT consultants in 10 regional offices around the state and teachers self-selected as to whether or not they would participate. Completion of the survey was reliant upon personal motivation and an expressed interest in this tool.

### **3.3 The research questions**

The following are the research questions that directed the data collection and served as a framework for the interpretation of the data in the findings:

- What do teachers and students see as the value of using interactive whiteboards in lesson designs and what beliefs do they hold about this technology and its relationship to learning and teaching?
- What is the role of the school in promoting use of the technology? What other contextual factors constrain or enhance the use of this technology in teaching and learning?

- What learning outcomes are supported by the use of interactive whiteboards in various Key Learning Areas? What learning tasks are associated with these outcomes?
- What pedagogical approaches are being used with this technology?

### **3.4 The research team**

The research team comprised the two authors of this report, Associate Professor Sandy Schuck and Dr Matthew Kearney, who are both teacher educators in the Faculty of Education at UTS and also belong to the research cluster Designs for Learning. Areas in which they teach include mathematics education, computer-based learning, mentoring in the workplace and research development. Their research projects are in the area of teacher learning and development, as well as learning and teaching in a digital age.

The other two researchers on this project were personnel from the CLI at DET. Both these personnel have extensive experience in working with schools in the area of ICT and pedagogy. The four researchers each took responsibility for different cases, with the first case serving as the exemplar for the others.

The data collected in all the cases was analysed and interpreted by the UTS researchers. The report is authored by Schuck and Kearney, with input in Chapter 4 and information and data on the online survey provided by CLI.

## **3.5 Methods**

### **3.5.1 Data collection**

Data were collected in a number of ways:

- a. Initial open-ended questionnaires for teachers and administrators to collect demographic information and views about administrative structures.
- b. Observation using a semi-structured observation schedule.
- c. Interviews with teachers and administrators and focus group interviews with selected students from the observed classes. Students were selected for these interviews by means of purposeful sampling (Bogdan & Biklen, 1998).
- d. Document and resource collection: School documentation about ICT management, rationale and use.
- e. An online survey was available on the CLI website for teachers to complete at their convenience.

As noted earlier, the questionnaire and interview schedules for teachers and administrators were merged into one instrument to expedite data collection and eliminate redundancy.

The instruments used in a – c above can be found in Appendix 1, as can the survey and its aggregated results.

#### **3.5.1.1 Initial open-ended questionnaires for teachers and administrators**

These were used to collect demographic information and probe participants' views about administrative structures. They also probed teachers' thinking about their pedagogical beliefs and approaches as well as their goals for their students. After

giving out questionnaires and then conducting interviews separately in the first case, the researchers decided to integrate the questionnaire and the interview schedule and to offer participants a choice of completing the questionnaire or being interviewed. This was found to streamline procedures and remove overlap from the questions. In all cases, teachers and administrators chose to be interviewed rather than complete the questionnaire.

### **3.5.1.2 Observation**

The researchers acted as observers in the classrooms to develop an understanding of what actually occurred there. The roles of the teacher, students and sometimes school administration were considered in these observations. A semi-structured observation schedule was used to enable the two observers to have some uniformity in their observations of the teaching and learning and at the same time be flexible enough to allow observation of the unexpected. Of interest were peer learning structures and ways that the students interacted within these structures, who initiated activities and directed them, the nature of learning tasks and the ways in which learning outcomes were achieved, and the ambience of the classroom. For example, researchers observed the interactions in the classroom, noting whether they were teacher-student interactions or student-student interactions. The types of interaction, such as questioning by teachers or by students and the purpose of the interaction were noted.

### **3.5.1.3 Interviews**

Teachers and administrators were interviewed (these interviews included questions from the questionnaire once they had been amalgamated). Selected students also were interviewed. They were selected for these interviews by means of purposeful sampling (Bogdan & Biklen, 1998) based on researcher observations and teacher recommendations.

A semi-structured interview schedule was developed, loosely based on one used in the report on pedagogy with student-generated digital video, titled *Students in the Director's Seat: Teaching and Learning across the Curriculum with Student-Generated Video* (Schuck & Kearney, 2004).

Attitudes towards the use of interactive whiteboards and purposes for their use were probed. Questions to teachers probed rationales for using this technology and for clarification of how the technology fitted with the teacher's beliefs about teaching and learning.

### **3.5.1.4 Document and resource collection**

The curriculum documents pertaining to the lessons were examined and the desired learning outcomes noted. The activities and resources were discussed with students and teachers to ascertain whether they felt learning outcomes had been achieved and these were also evaluated by the researchers to this end.

## **3.5.2 Analysis**

The story of each case school was constructed and developed from the multiple sources of data on that case. These followed a proforma developed by the UTS investigators for the first case school, which ensured that data related to the research questions were captured. Each case study was constructed by one researcher

and then shared with the researchers who had collected the data. Those researchers checked the case study for veracity and accuracy, referring to the audio-tapes in case of disparities in understandings. The case studies were then collected together by the UTS researchers. They were collectively examined for trends and differences amongst the case schools. Each case was examined for what it said about practice, pedagogy and beliefs about teaching and learning and educational technology. Both UTS researchers developed a framework of themes in response to the research questions from the data, and then engaged in critical collaborative reflection (Bullough & Gitlin, 1991). This reflection enabled the researchers to modify the framework so that it fitted both their interpretations of the data. The framework was later shared with the CLI researchers and discussed to gain inter-researcher reliability.

### **3.6 Participants**

The CLI is highly involved in professional development using technology (see for example, the TaLe website). Therefore, our industry partners had observed schools using interactive whiteboards for pedagogical purposes in a variety of curriculum areas. They provided the UTS team with a list of such schools. As noted earlier, the use of IWBs is in the early stages in DET schools and so the schools in the study had different levels of experience with their use. Schools in which strong support from the administration and a whole-school interest in using the technology exists were favoured for selection. As noted above, schools were further selected so that there were both primary and secondary schools and a range of curriculum areas and pedagogical contexts for the use of the technology.

Within each school, recommendations by the principal and willingness by teachers and students (and their parents) to participate in the study provided a basis for the selection of up to three teachers and their classes for in-depth study.

#### **3.6.1 Profiles of the participating schools**

Table 1.1 gives a summary of the schools that participated in this study. What follows is a description of the schools, with details about the classes and teachers participating in the study. *All names are pseudonyms to ensure confidentiality of participants.*

##### **3.6.1.1 School 1: Darcy Public School**

###### **3.6.1.1.1 Context of school**

Darcy Public School is a large Year K-6 state school on the northern beaches of Sydney. The website describes it as follows:

Darcy Public School is situated in grassy, well-maintained grounds with extensive areas for playing. The school has a strong emphasis on academic achievement, especially in literacy and numeracy. Student welfare programs including a discipline code and peer support program have a high priority. Excellent programs are provided for gifted and talented students as well as for students who have special needs. ... The computer education program has been enlarged with the acquisition of additional computers. ... The school's Mission Statement is: "In a safe and happy environment, students at Darcy Public School are empowered to achieve their potential and become worthy citizens".

Students are from a range of SES backgrounds with the majority of students of middle SES. There are approximately 800 students and 30 classes. There are 4 classes across each year + 2 IO classes and 2 OC classes. Most classes have approx. 25-30 students. There is a high proportion of integration students in classes throughout the school.

The Principal of Darcy, Tom noted that there was a wide demographic from a diverse range of socio-economic groups.

There are high expectations of learning here – parents are interested in outcomes across the board, there are many cultural activities e.g. chess club, bands, an art show – there is great opportunity around music, art, students perform at the Opera House every year. Tom noted: “there is what I call ‘unlimited opportunity’ – tradition of enrichment classes in Years 2-6 and OC in Years 5 and 6 – most parents want to have their children in the enrichment stream”. Teachers are supportive of the G&T program with many doing courses at university in this area. The environment, according to the principal, is very supportive.

There are professional development (PD) days, for staff and ICT is a priority of the executive. The Principal, Tom, initiated the use of IWBs.

#### ***3.6.1.1.2 Data collected from the school***

Given that this was the first case study school, it was deemed important for the entire research team to have visited the school and spent some time in observation and interviews there. This allowed the team to compare data collected and ensure that there was a shared understanding of our purpose in being there and our ways of collecting data. Consequently, the school was visited on three days, by different dyads from the research team, so that by the conclusion of the visits all researchers had visited the school.

At Darcy, we observed the classes of four teachers. These comprised a year 2 class taught by Quentin, a year 4 taught by Samantha and two year five classes (taught by Pam and Rosemary). We conducted interviews with the four teachers, the Principal, Deputy Principal and with students from the classes we observed. Photographs of the classrooms and the lessons were also included.

### **3.6.1.2 School 2: Ridges Public School**

#### ***3.6.1.2.1 Context of school***

Ridges Public School is a medium to large school located in the western suburbs of Sydney. Students representing approximately 30 different ethnic groups and students with vastly different socio-economic backgrounds attend the school. There are currently 540 students and 21 classes K-6.

The school has students from vastly differing socio-economic backgrounds. Technology plays an important part in providing “a common language” (Relieving Principal). The school website states that “Our school is blessed with an expansive amount of technology. The whole school is networked allowing continual access to the Internet. We have a technology centre where students work on their own individual computer, across 2 platforms. Classrooms are also well accommodated in this regard. Students also have the opportunity to work with a wide variety of computer software and peripherals such as digital cameras, digital video cameras, scanners and data projectors.” The school participated in the Intel Teach to the Future professional development program. The school policy document for use of technology

in teaching and learning states “*Ridges Public School sees itself as a technology school committed to the integration of technology into teaching and learning.*”

The Relieving Principal, Bernice, noted that the culture in the school is one of openness. It provides a climate in which teachers are encouraged to be innovative. Staff agreed that teachers are supported in their work and that there is a collegial atmosphere.

#### ***3.6.1.2.2 Data collected from the school***

At Ridges two researchers visited and spent three days there. They saw two lessons in each of three classes, a year 5 class taught by Catie, a year 4 class taught by Evie and a Kindergarten class taught by Donna. They conducted interviews with the participating teachers and with the Assistant Principal, Francine, the Relieving Principal, Bernice, and the Head of the ICT committee, a teacher librarian, Astrid. Focus groups were held with children from each of the three classes observed. Photographs of the classrooms and the lessons were also included.

### **3.6.1.3 School 3: Hidcote Girls’ High School**

#### ***3.6.1.3.1 Context of school***

Hidcote Girls’ High School (HGHS) is a secondary school in the northern suburbs of Sydney. The local suburbs are considered to be an affluent area. There is a high degree of computer access at home and students are confident users of ICT. The school currently has over 1300 students with a waiting list of students wanting to enrol. The staff numbers 90 with 10 faculties.

The school was established as a local comprehensive high school in 1958. The website states that: “The school values its history and celebrates its heritage as the bequest for all current students who continue to strengthen our heritage and culture and create new traditions as well. We continue to celebrate outstanding student achievement across the comprehensive range of interests and abilities as measured by exceptional results in the School Certificate (SC) tests and HSC examinations. We also achieve and maintain a standard of excellence across a broad band of curriculum enrichment programs. Also valued is the strong partnership between staff, students and parents, a partnership which contributes significantly to the success and reputation of the school. Emphasis is placed on open and regular communication between all three groups.”

The school is regarded as successful and the Principal noted the need “to overcome the inertia of a successful school”. The school is seen by parents as desirable. The school is also seen as desirable by teachers. There are very few transfers from the school. At the moment there is one active transfer from a staff member and this is because of locality. (The teacher wants to work close to where he/she lives.) Staff tend to stay until they retire from HGHS. This makes for an established and stable staff with minimum turnover.

#### ***3.6.1.3.2 Data collected from the school***

Two members of the team participated in visits to this school. Three site visits were conducted. During the site visits the researchers observed six lessons by three teachers with four classes. The classes were year 11 Geography (taught by Geraldine), year 7 PDHPE (taught by Hannah), year 9 Health (taught by Ingrid), year 10 Business Studies (taught by Geraldine). They also interviewed the three teachers, the Deputy Principal, Keith, and the Principal, Jacqueline, and had focus groups with the year 9,

year 11 and year 7 classes. Examples of work from Geraldine's classes were also included in the data, including printouts from the IWB. Photographs of the classrooms and the lessons were also included.

### **3.6.1.4 School 4: Bayview Senior Secondary College**

#### ***3.6.1.4.1 Context of school***

The secondary coeducational college, of which Bayview Senior Secondary College (SCC) forms part, has three campuses, located in a coastal area outside of Sydney. One of the campuses is part of the Priority Schools Funding Program (PSFP). The PSFP campus, together with a second campus, are both junior secondary. The case school (Bayview) is the senior school and has students in years 11 and 12 only. There are almost 3000 students in the whole school, and approximately 750 at the senior school. The school was previously one of three separate schools, on three different campuses. In 2000 the case school was gazetted to be a senior college. Prior to that it was a year 7-12 comprehensive school with 1300 students. The whole college, comprising the three campuses, began operating in 2002. The other two schools are feeder schools to this one. Numbers at Bayview are dependant on the feeder school numbers in year 10. However, an increasing number of students from private schools now come to Bayview in year 11.

The school prides itself on the large choice in curriculum – it offers 54 school based courses and TAFE courses, and a full range of VET except for rural industries. Over 40% of students opt for UAI's and do well. Others do a vocational/recreational type curriculum.

In terms of SES status, the school draws on a varied population, including students from private schools and students from the PSFP school. Families range from dwelling in very affluent areas to dwelling in 24 caravan parks and housing estates. An estimated 60% of the students have access to the Internet. Some students come from generations of families who have been unemployed and some of the students are the first to get an HSC in the family. The Principal, Zach, noted that the "work ethic for some of the students is not strong .... They work and juggle huge numbers of hours working with their schoolwork. Some do really well, ...."

He went on to say "The school sets high standards, so retention is not so good, because if they are here, they are expected to work. Lots get work on the way through, which is a good outcome for them, but a few drop out." The school is trying to track their students in post-school destinations.

There is a very experienced staff. There are four principals for the three schools. There is a college principal, who does not have line management but coordinates the college. The principal of the senior college was interviewed in the case study.

#### ***3.6.1.4.2 Data collected from the school***

Three researchers visited this school in pairs, one pair at the end of second term and the other pair in third term. One researcher attended both visits. The delay between visits was deliberate, as the school was setting up a number of rooms with IWBs during the holidays and the researchers wished to visit again when they were in place.

The researchers interviewed the Principal, Zach, the Deputy Principal, Annette, and two teachers, one in HSIE (Will) and the other in IPT (Val). They observed two lessons with each of a year 11 Business Studies class (taught by Will) and a year 12 IPT class (taught by Val). They also conducted focus groups with students from the year 11 and year 12 classes. Finally, they examined the college technology policy.

### **3.6.1.5 School 5: Kirkland PS**

#### ***3.6.1.5.1 Context of school***

Kirkland Public School (KPS) is a small school in the central west of NSW. The school is located in the centre of a tiny grain-handling town at the centre of a black soil region which produces wheat, sheep, fat lambs and prime beef. The school currently has nine students with a teaching principal. A number of the students have learning difficulties and come from low SES families. Its motto is "Striving to Succeed". The school website notes that the school's mission is "To provide a safe, fair, friendly and clean environment. For learning to be fun, exciting, interesting and cooperative. To be responsible and respectful members of the community."

Eight of the students have their own webpages in various states of completion. There is a school newsletter that appears on the website.

The school grounds are generally well cared for although the drought has meant it is very dusty and parched. The school classroom (a double) takes up most of the main building with small rooms off it – which are used for variety of purposes. There is a small library.

#### ***3.6.1.5.2 Data collected from the school***

Two researchers visited the school for one day. They interviewed the teaching principal, Leah, and observed her teaching during various sessions of the day. Other data included one focus group, a questionnaire completed by the principal and photographs of the school.

### **3.6.1.6 School 6: Sheridan Public School**

#### ***3.6.1.6.1 Context of school***

Sheridan Public School (SPS) is a primary school in the central west of NSW. The surrounding local suburbs are considered affluent, however, that does not mean that the children who live in these suburbs necessarily go to SPS. Indeed, the school has PSFP status. SPS currently has over 440 students with six classes for children with special needs. Ten percent of the students are indigenous. The staff number 90, and there are 20 classes. There is a high degree of computer access at home (about 60%) but it is not known how many have access to the Internet. Students are confident users of ICT. The school motto is "a tradition of excellence".

The school website is quite sophisticated and provides a great deal of information about the school. For example: "Sheridan is a small town with a population of approximately 8,000 in central western New South Wales. The area is rich in history ... - a legacy of the gold rush years of the 1800s.

Public education in Sheridan was established in 1862 and has undergone a number of transitions in that time. Sheridan Public School, in its present form and location, recently celebrated its 50th birthday."

Sheridan has two computer labs - one as an integral part of the library - and interactive whiteboards in all primary (stage 2 and 3) classrooms and the library. Stage One and Early Stage One classes expect to have IWBs installed in the near future.

The Principal, Oliver, describes Sheridan PS as a typical rural school, struggling to hold its numbers in a town where he believes the “professional classes” have moved to the larger centres.

#### ***3.6.1.6.2 Data collected from the school***

Two researchers visited the school and spent one day there. They interviewed the Principal (Oliver), the IO teacher (Mary) and a year 6 teacher (Natalie). They observed lessons in Mary’s and Natalie’s classes. They collected questionnaires from the three staff members and also took photographs.

### **3.7 Ethical issues**

The research project underwent rigorous ethical approval procedures. An application was made to the UTS Human Research Ethics Committee and approval was granted (see Appendix 2.1). Approval was then sought from the DET SERAP process and this too was granted (see Appendix 2.2).

Teachers, executive staff and other school personnel were all provided with consent forms and asked to sign consent letters if they were happy to participate. Students were given letters to show parents and had to have signed consent letters to be interviewed in focus groups. All consent letters can be seen in Appendix 2.3.

The schools were all guaranteed confidentiality in the information letters and students were not identifiable from photographs and data. All photographs chosen for this report are included in Chapter 4.

### **3.8 Summary**

The project investigated the practices and perceptions of teachers, executive staff and students using IWBs in pedagogical ways. The study was not longitudinal but was a snapshot in time of practices and experiences in six case schools. These schools had owned IWBs for time periods ranging from a few weeks to three or four years and their teachers were all at varying levels of expertise and confidence in use of IWBS.

Case studies were conducted, ranging from one day to three day visits by two researchers. Data were collected in the form of questionnaires, interviews, observations and focus groups. As well, an online survey was completed by members of a professional learning community. The focus of the cases was teachers’ and students’ perceptions of the value of IWBs and their pedagogy and practices with the technology.

The study was underpinned by a socio-cultural perspective which acknowledges the reciprocal interaction between tools and their users, as well as the complexity of the classroom and the specificity of each unique context.

## 4. Example Lessons and links to the Quality Teaching Framework

### 4.1 Links to the Quality Teaching Framework

The Quality Teaching Framework (QTF) used by the NSW Department of Education and Training (DET) focuses attention on pedagogy in public schools. It has three dimensions of pedagogy for classroom practice: intellectual quality, quality learning environment and significance.

Intellectual quality is central to the framework and focuses on producing deep understanding of important, substantive concepts, skills and ideas. Problematic knowledge, engagement in higher-order thinking and communication are emphasised in such pedagogy.

Quality learning environments are classrooms where teachers and students work productively in an environment focused on learning. High expectations and positive relationships between teachers and students are promoted.

To ensure significance of the work, clear connections are drawn between the work and students' prior knowledge and identities, contexts outside the classroom and multiple ways of knowing as well as cultural perspectives (DET, 2006)<sup>1</sup>.

Many of the teachers in the IWB study mentioned the QTF and its influence on their teaching. The sample lessons given below illustrate aspects of the framework. While we observed a large number of lessons, full detail is not provided for each one. A summary table with outlines of all observed lessons, as well as descriptions of some lessons which were described to us, follows the discussion of the exemplars.

### 4.2 Examples

Seven lessons are discussed in this section. These lessons were selected because the researchers felt they exhibited aspects of QTF (see above). They also cover a range of topics, age groups and schools. The lessons frequently displayed elements from the *Quality Learning Environment* and *Significance* dimensions of the QTF. *Engagement* and *Connectedness* elements were particularly evident. It is worth noting that this finding matched results from the online survey, with responses to item 13 from the survey (n=87) indicating that these two elements were rated highly as 'easy to embed' in classroom use of the IWB (*Engagement* 100% and *Connectedness* 86% - see Appendix 1.6).

All lessons discussed were observed by two researchers, providing triangulation of data. Further lessons and uses of the IWB are presented in section 4.3.

#### 4.2.1 Example Lesson 1: Samantha and Year 4 at Darcy P.S.

*Lesson topic:* Mathematics: subtraction.

*Outline of lesson:* Students started the lesson seated on the floor. A procedure for doing subtraction was modelled and students did examples on the IWB. For example, they looked at a written algorithm illustrating subtraction by decomposition and also discussed "adding on" and difference examples, using mental strategies, for example,

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<sup>1</sup> DET (2006). About Quality Teaching. Retrieved 21 November 2006 from <https://www.det.nsw.edu.au/proflearn/areas/qt/qt.htm>

“what must we add to ... to get ....?”, or “what is the difference between ... and ....?”. They used a Le@rning Federation learning object<sup>2</sup> that modelled the ‘adding on’ method. Samantha modeled the decomposition method alongside on the (traditional) whiteboard.

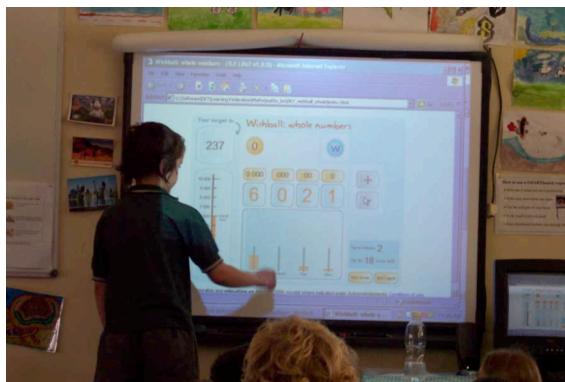
Children used both boards (IWB and traditional whiteboard) together, to look at the alternative ways of computing the subtraction. Students were given a choice of method to use. A few examples were modeled using each method, with students coming to the board and either completing the question by writing out the algorithm for decomposition or completing the “what must be added” process on the IWB. Using both methods alongside each other on the two different boards gave the opportunity to verify results by checking that the same answer was given in both cases.

Students then moved to their seats after a few examples had been modelled and individual students had come up and answered a few questions. Students used their books to work individually on examples from the IWB. The teacher walked around the room assisting students having difficulties. She made use of the traditional whiteboard to reinforce points made during the lesson and to write additional examples. Alternate answers were given by teacher to facilitate discussion of why they might be wrong. The whole class then came together and corrected their work, using the IWB for ‘adding on’ and the traditional whiteboard for ‘decomposition’.

*Learning outcomes:* Children learned subtraction with two-digit numbers, using different methods. Understanding was evident from their responses. There was no formal assessment, rather discussion of correct and incorrect answers.

*Quality Teaching Framework:* The lesson featured an emphasis on understanding of difficult concepts by offering alternative ways of working. One method developed mental strategies and the other showed the equivalence in using a written algorithm. To show the alternatives, different media were used, the learning object and the written algorithm. Future lessons could focus on choosing the appropriate strategy for a particular problem.

*Noteworthy features of the lesson:* Students did not have input into the design of lesson but were given a choice of which method to use. The task was a closed one and closed questions were used by teacher. Student roles included responding to questions, and doing the exercise. They did not ask questions of the teacher and did not question other students’ explanations.



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<sup>2</sup> The Le@rning Federation (TLF) is a project that employs emerging technologies to produce online curriculum content to encourage student learning and support teachers in Australian and New Zealand schools. TLF is an initiative of the state, territory and federal governments of Australia and New Zealand.

The noteworthy feature of the lesson was the way the two boards were used together to show alternative ways of answering. This process worked well. A useful feature was that students could stand at the board rather than at the computer to answer.

#### **4.2.2 Example Lesson 2: Rosemary and Year 5 at Darcy P.S.**

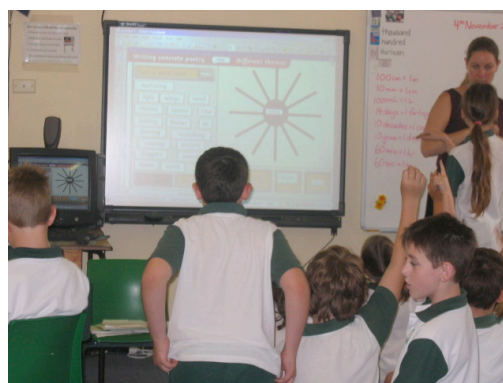
*Lesson topic:* English: comprehension.

*Outline of lesson:* Rosemary mind-mapped on the traditional whiteboard with each skill being explained and examples found from the text being used (titled the Potato Famine). After students silently read the text from the board for a few minutes, the teacher led a class discussion, focusing on the main idea of the passage. During this discussion, Rosemary frequently asked focus questions to stimulate ideas. Students came out and highlighted aspects of the text (relevant to their answers) using the interactive whiteboard functions. Rosemary then used the Internet to find additional information on aspects of the Potato Famine, comparing information found in the passage and the Internet site. The teacher toggled between the text and Internet sites she had previously bookmarked. Students were then given the option of working independently before splitting into groups: a reading group; a group working on a comprehension task with guided questions; and a student group (of six students) working independently using a Le@rning Federation learning object on the IWB and slate. The teacher mainly helped the reading group during this stage.

*Learning outcomes:* Reading and comprehension skills

*Quality Teaching Framework:* The teacher tried to create meaning for the students via use of the websites. Elements of the QT model were evident, including students' self-regulation, social support, student direction, connectedness and engagement.

*Other noteworthy features of the lesson:* The teacher used the IWB effectively to model comprehension skills, in preparation for the students' own work. Independent, small group use of the IWB was also evident.



#### **4.2.3 Example Lesson 3: Catie and Year 5 at Ridges P.S.**

*Lesson topic:* English: concrete poetry

*Outline of lesson:* Students were seated on the floor in front of the IWB with the teacher to the right of the IWB. The lesson began with teacher-led discussion of concrete poems. Catie read a poem titled *Skateboarder*, drawing attention to adjectives used. Examples of adjectives were taken from IWB software. Students discussed the shape of the poem and the words used. Using a house template from the IWB software, students then volunteered words to collaboratively build a concrete poem about a house. These words were written onto the outline of the house (on the IWB) and the poem was reviewed by the class. After completion of the *House* poem it was read to the class by one of the students. Students were then shown different shapes and asked to work in pairs back on their own computers (arranged in pods around the room) to create concrete poems for 2 of the shapes.

*Learning outcomes:* Develop appreciation of and ability to construct poetry. The students did seem to understand adjectives and how to construct a concrete poem.

*Quality Teaching Framework:* The lesson featured a variety of QT features, such as high engagement of students, evidence of higher-order thinking and participation in discussion. Positive relationships were a feature of the class dynamics and communication and high expectations were encouraged.

*Other noteworthy features of the lesson:* The teacher was able to manipulate the poem templates on the IWB, allowing just the outline to remain. Students were able to use the interactive tools to write their ideas into the outline. The initial poem was created by the whole class in an innovative way and served as a useful model for the remaining small group activities.



#### **4.2.4 Example Lesson 4: Donna and Year K at Ridges P.S.**

Lesson topic: The seasons

*Outline of lesson:* Students were seated on floor in front of IWB. The teacher began with a discussion of the seasons, prompted by her questions such as ‘how many seasons in a year? What are the names of the seasons? What months are in what seasons? During the discussion students were asked to describe each season. A matching activity followed with students coming out to the IWB and matching the appropriate image to the name of the season by dragging the name to the suitable place on the IWB.

Revision continued using IWB software. One page contained images and words and students came out and matched the month to the relevant season. Each word or image was read and identified before the students placed it into the appropriate column. Positive reinforcement was given to each student and all children ‘had a turn’. Some students could read the words without being prompted by the teacher.

Class discussion moved to appropriate clothing for each season. The activity was creatively interspersed with physical activity where students ‘acted’ some aspects of various words.

*Learning outcomes:* To understand various aspects of the seasons.

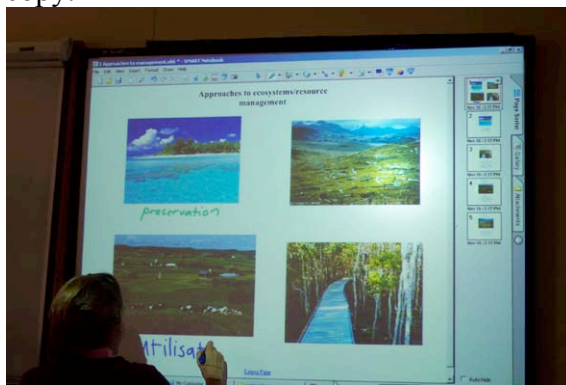
*Quality Teaching Framework:* The lesson featured a variety of QT features, such as high engagement of students, participation in discussion and connectedness. Students’ background knowledge was considered and strong social support was evident.

*Other noteworthy features of the lesson:* The teacher catered for kinesthetic learners by including physical activities in front of the IWB to supplement the class discussion. Although this activity could have been completed with an overhead projector, normal whiteboard, charts with movable cards and/or worksheets etc., these young children clearly enjoyed manipulating the images on the IWB.



#### 4.2.5 Example Lesson 5: Geraldine and Year 11 at Hidcote GHS.

*Lesson topic:* Geography: ecosystems and environmental management.  
*Outline of lesson:* The lesson started with students seated in a 'U' shape with Geraldine at the front near the IWB, which was connected to a computer on a trolley. Geraldine re-capped on the previous lesson, using the IWB to scroll through notes from that lesson. She then discussed the philosophies of ecosystem management. Text descriptions of the different management philosophies were displayed on the IWB and students had to match the particular management philosophy description with the definition. The students came up to the IWB to link (by moving the text around) the description and the definition and to discuss the answers. There were 15 students in the class, so they worked as the one group. Geraldine then printed off the descriptions and definitions from the IWB and handed them to all students so that they each had a copy.



Four PowerPoint slides were shown, each with a photographic image of a particular ecosystem. Students had to decide which strategy was used in each image. They had to discuss the characteristics of each strategy to decide which image they best fitted. Students were able to write on the IWB. Geraldine then revealed the correct answers (already on the board) and

more discussion took place.

*Learning outcomes:* Outcomes were to develop a deep understanding of ecosystem management and look at how such management is applied. These learning outcomes were monitored throughout the lesson. There was a high level of discussion, both between teacher and students and amongst students. Geraldine used questioning to elicit higher-order thinking and made suggestions to assist with the connections.



*Quality Teaching Framework:* The lesson featured a variety of QT elements, such as high engagement of students, evidence of higher-order thinking and participation in discussion, as well as connectedness to real-life situations through the examples presented on the IWB. Positive relationships were a feature of the class dynamics and communication was encouraged and of a high standard.

*Other noteworthy features of the lesson:* Students were very involved and full use was made of the features of the IWB. These could not have easily been replaced by other technologies.

#### 4.2.6 Example Lesson 6: Ingrid and Year 7 at Hidcote GHS.



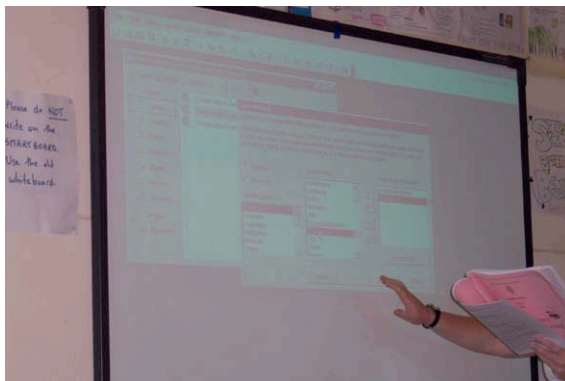
*Lesson topic:* PDHPE: Learning to use an electronic database.

*Outline of lesson:* Students were seated in a double 'U' shape with 15 computers behind them, lining the walls. There were thirty students. Lesson began by Ingrid allocating students in pairs to the computers. (Ingrid determined the pairing.) Students were instructed to log on to the computers and then to turn around to face Ingrid. Ingrid demonstrated the

construction (step-by-step) of an Access database on the IWB. Then students were told to do likewise. Ingrid watched students as they proceeded to construct their own databases, and enter data using a workbook which contained the details of the data to be inputted. At the end of the lesson students were reminded to save their work.

*Learning outcomes:* Students were learning to construct an electronic database to use in PDHPE. Ingrid was very pleased with the results as she had previously tried this lesson without using the IWB and students had been confused as to what they should be doing. In the observed lesson, students were able to follow the instructions without difficulty because they could see what it should look like and what to look for. Ingrid observed and monitored progress throughout the lesson.

*Quality Teaching Framework:* The lesson featured an emphasis on application of an important skill. Creating the database enabled students to store data through their investigations in PDHPE. Students were engaged and active in construction of their own understanding of how to do this.



*Other noteworthy features of the lesson:* The use of the IWB was particularly appropriate for this lesson as it allowed Ingrid to face the students and show them on the IWB where the different features were and how to access them. Ingrid was able to point to the fields and operate from the screen without having to go backwards and forwards.

#### 4.2.7 Example Lesson 7: Mary and IO class at Sheridan.

Mary is the IO teacher of 7 students with special needs in the moderate to severe category.

*Lesson topic:* Spelling, reading, numeracy and writing

*Outline of lesson:* Students commenced the lesson seated on individual mats on the carpet. Each mat was placed approximately one metre from the IWB which was mounted close to the floor. The teacher sat on a low chair beside the interactive whiteboard in front of the class. A teacher's aide sat between two of the students sitting on the floor.

Routine morning activity commenced with whole class recital of the date, time and season. The teacher asked each student to introduce themselves to the class. Discussion of the weather led by the teacher followed. Each student was given a personalised explanation of an activity they were to complete when they left the floor.

The students commenced work on various tasks:

- two started to write their news for the day in workbooks with the support of the teacher's aide
- one read to the teacher from a class reader
- two worked collaboratively, then independently on the interactive whiteboard using an antonym activity prepared by the teacher – this pair then progressed onto a number matching game (from The Le@rning Federation)
- one student who had not followed instructions used construction toys on the floor to build a city.



During the first hour of the day these students rotated between different activities at the teacher's request. The teacher clearly aimed to have a pair of students, or an individual working on the IWB at all times of the lesson; making the comment that if she had the funds she would like another interactive whiteboard at the other end of the classroom.

Throughout the lesson students were engaged and on task, their obvious motivation around activities centred on using the IWB was palpable e.g. one child who was physically disabled tapped the IWB with her hand when counting numbers, and when she answered correctly she danced around on her mat - clearly delighted that she had been successful. The teacher remarked that 'counting numbers on a page of stencilled sheet is quite different to watching ladybirds flash and move on a screen to music'.



*Quality Teaching Framework:* The lesson featured an emphasis on lengthening the attention span of students in terms of task completion and repetition. Elements of the QTF for example, students' self-regulation, student direction, connectedness and inclusivity were evident.

*Other noteworthy features of the lesson:* The learning in this lesson was highly structured, as one might expect in an IO class. Flexibility and independent work came from students being able to move between activities once they had completed small-bite-sized learning components. In the forefront of teacher planning were activities that attempted to increase student attention span, and the interactive whiteboard serves this purpose well in this classroom. Engagement and social support are core values of the tool in this Special Education context.

Room layout was premised on the position of the interactive whiteboard, this ensured students did not distract one another when they were working collaboratively, independently at a desk or when being supported individually by a teacher's aide.

Mary constantly moved from the floor, to the interactive whiteboard, to a desk, then to assist students with toileting then back to desk activity; the sheer physical demands of teaching students with high needs was observable.

The teacher predominantly used visual teaching and learning resources, scanning in sheets onto the interactive whiteboard for display, downloading material onto CDs to be used by students as their personalised learning program. The use of other technologies like photocopiers and printers assisted her preparation for lessons. She stated that her weekly goals were to expose students to a range of teacher-prepared material using PowerPoint presentations, the Internet and hyperlinks.

### **4.3 Overview of other IWB uses from case schools**

In addition to the lessons described in the previous section, there were approximately 40 further uses of the IWB, across a range of curriculum areas, either observed in lessons by the researchers or discussed by teachers in interviews and surveys. Details and contexts are outlined in Table 4.1

Table 4.1 Description of IWB uses from study

KLA / Class / Brief Description	Teacher / School
<p><b>1. Maths / Science. Yr. 5.</b> Pam used the ‘number line’, drawn using functions of the IWBs. She discussed labelling for different uses, particularly temperature. Pam accessed weather sites using Google and looked at placing positive and negative temps on the number line. Extract from case: For example, Pam did a lesson on negative numbers ... and the students asked her ‘<i>how is this relevant?</i>’ Pam: “<i>I was able to pull up a weather program ... the whole class could see it. It was large, it was interactive, they were able to see the negative numbers ...</i>”</p>	Pam / Darcy (Discussed)
<p><b>2. HSIE. Yr. 5.</b> Students have also done ‘virtual holidays’ overseas, choosing specific stopovers on the way to their destination. They accessed the Qantas website for information on destinations, time taken, and other websites for currency conversion. Pam’s students later recalled this activity. Extract from case: <i>They enjoyed placing and viewing maps of the world on the flipchart and recalled going to the Qantas web site to analyse the flight routes</i></p>	Pam / Darcy (Discussed)
<p><b>3. Maths. Yr. 5.</b> Use of TLF learning objects (Eg. Maths games such as the one on probability) and other games.</p>	Pam / Darcy (Discussed)
<p><b>4. English: Yr. 5.</b> Use of quotation (speech) marks in writing. Designed to stimulate students to write their own stories &amp; to correctly use quotation marks in their stories.  <i>Outline:</i> A word document was displayed on the IWBs and the lesson was structured around demonstrations. Frequent teacher questions to the class. Volunteers coming out the front of the class to demo. their responses to the teacher’s questions. Students often used the highlight tool to emphasise important sentences, grammatical structures etc. in the passages on the screen. After 25 mins., students went to their desks to write their own stories. Any child who was still struggling was invited to stay ‘on the floor’ for more expository work with teacher. The teacher aide helped the students at their desks (most students) while Pam remained with the struggling students at the IWBs.  <i>Other:</i> Skilful teacher questions and general class management were a key to the success of this lesson.</p>	Pam / Darcy (Observed)
<p><b>5. English: Yr. 5.</b> Writing exercise. <i>Purpose:</i> An exposition exercise in preparation for assessment writing task.  <i>Outline:</i> Exposition shown on IWB, class went through different parts of speech and punctuation. Pam directed the task from the IWB. Students circled different parts of speech in a passage using colours. Students will continue with lesson by writing narratives when they return to class.  <i>Other:</i> Teacher initiated questions. Questioning used to develop concepts. Student roles were interactive for some (those that answered questions). The teacher marked up their responses on the IWB. Students did not ask questions of the teacher and did not question other students’ explanations.</p>	Pam / Darcy (Observed)

<p><b>6. English. Yr. 5.</b> Rosemary has used the IWBs for spelling at the beginning of lesson ... esp. the ‘active board’ tool to change order, underlining, meaning etc. She has also used the <i>spotlight feature</i> as whole class to demonstrate principles of grammar.</p>	<p>Rosemary / Darcy (Discussed)</p>
<p><b>7. Maths. Yr. 5.</b> Rosemary used a learning object called <i>Wishball</i> (from TLF). The general sequence here is to start with a whole class demonstration before one group has control of the slate. She had also used web pages and general presentations ... such as ‘show and tell’ sessions (incl. students’ PP presentations). Students later commented on this LO. Extract from case study: J liked the <i>Wishball</i> learning object: “You can talk to your friends make decisions.” C liked the learning object called Catch a Thief and thought it encouraged teamwork.</p>	<p>Rosemary / Darcy (Discussed)</p>
<p><b>8. Maths. Yr. 5.</b> Identifying shapes and diagonals. <i>Outline.</i> The teacher directed the lesson using the IWB and laptop. Teacher explained properties of shapes and showed examples on IWB. There was discussion of diagonals using the IWB to demonstrate examples. Students came out to the IWB and drew shapes and other students then came and drew diagonals where applicable. The teacher also put a set of scanned shapes (from textbook) on the IWB and students drew in diagonals on these. After initial modelling and discussion students broke into maths groups. Teacher set each group a specific task, one or two groups of them were working from the same page in the textbook. The teacher worked extensively with one group on octagons and played maths games with them prior to bookwork.</p>	<p>Rosemary / Darcy (Observed)</p>
<p><b>9. Maths. Yr 4.</b> Samantha has used the game <i>Everlasting Addition</i>. She generally asks volunteers to model solutions out the front (for other students). These demonstration sessions (with games) tend to generate questions ... students then work at their desk on their solutions (to these questions). Then more volunteers come out to display their solution on the IWBs. Samantha’s students also commented on their use of TLF learning objects (including a learning object on the Digestive System, a Maths game called <i>Wishball</i>, and a web site on body systems).</p>	<p>Samantha / Darcy (Discussed)</p>
<p><b>10. Science. Yr 4.</b> Samantha has used the gallery from the IWB eg. to display pictures of the human body (labelled and unlabelled). For example, she displayed the picture of the skeletal system. The students were asked to draw (copy) the skeletal system from the IWBs (Samantha had displayed the (unlabelled) picture). The students copied and they labelled the system together. Students used their drawings to construct a skeletal system out of ‘pasta’.</p>	<p>Samantha / Darcy (Discussed)</p>
<p><b>11. Writing / spelling. Yr 4.</b> Samantha’s students brainstormed a ‘space’ word for a narrative. They used the pens to write the words on the board then clicked the word for text recognition. This facility (‘text recognition’) allowed 4 choices of spelling. This helped poor spellers. Also, for <i>Hand-writing modeling</i>: Samantha cut and pasted text into the computer before the lesson and puts it into ‘modified cursive’ style ... hence, she has <i>more time to talk</i> with the students than modelling hand-writing on the (old) board.</p>	<p>Samantha / Darcy (Discussed)</p>

<p><b>12. English. Yr 4.</b> Poetry lesson – concrete poems using software which came with the IWBs</p> <p><i>Outline:</i> Students initially seated on the floor in front of the IWB. Teacher modelled concrete poems using examples from the suggested lessons which were included in the IWB package. Teacher preferred to direct the lesson from the desktop computer rather than the IWBs. (She commented it was “just easier” to do it this way) There was discussion of elements of concrete poems. Teacher also asked about adjectives. A different shape was selected for the next concrete poem which the class created collaboratively as a model. Students who wished to ‘have a turn’ came out to the IWB and added their own adjectives to the word bank included with the software. Students placed the words from the word bank onto the image chosen from the software. The software enabled students to manipulate the words they had chosen - font size and direction (according to the student’s choice). After completion of this collaboratively created poem, volunteers were asked to read it in different ways by emphasising particular words e.g. varying volume and pitch.</p> <p>Students then returned to their desks and chose another image for their own concrete poems. This could be either one the examples shown or an idea of their own. Students followed the modelled procedure in the creation of their poems (a ghost theme was a popular choice). The IWBs was left on in the background ... the picture on the screen was a stimulating ‘backdrop’ for students’ own writing (whilst at their desks). The teacher walked around the room giving suggestions or assistance where required. She often directed her comments to the whole class (even when monitoring students at their desks). As students completed their poems they came to the front of the room and read their poems to the class with the teacher offering suggestions on how to bring more feeling and expression into their reading.</p> <p>Some students were asked to come out the front to place their words on to the picture (using the IWBs). They again enjoyed manipulating their text (fonts, position on picture etc.). A few seemed to get distracted by the ‘placement of their words’ on the screen.</p> <p><i>Other:</i> Students were engaged in this activity and obviously enjoyed creating their own concrete poems. Volunteers were very focused – many enthusiastic volunteers. <i>Having a choice of poem topics seemed to be helpful.</i> The teacher planned later to print out the students’ work and place it as a poster on the wall as stimulus material for their own bookwork.</p>	<p>Samantha / Darcy (Observed)</p>
<p><b>13. Reading. Yr 2.</b> Quentin used the IWBs for Reading groups. Students used a phonics and grammar program. Quentin worked through these programs together with the students (as a class). He also liked letting smaller groups use the IWBs. For example, he organised four reading groups. Quentin worked with the IWBs group while other groups work independently. eg. He used the readers on IWBs. He read them a story and they did a series of exercises. (He liked the fact that the program recorded progress - what skills they’ve covered ) Quentin also liked the grammar program and used it as a whole class activity: “For example,</p>	<p>Quentin / Darcy (Discussed)</p>

we might do proper nouns and we do it together”	
<b>14. Art. Yr 2.</b> Quentin has used Paint programs eg. MS Paint for Art. He liked how he can quickly demonstrate the type of drawing / artwork he is looking for. Quentin also used a laser pointer when using the IWBs.	Quentin / Darcy (Discussed)
<b>15. English. Yr 2.</b> Quentin’s class used a drill and practice game on ‘adjectives –a ‘fill in the blanks’ exercise set in the context of a spaceship expedition. After each ‘nominee’ came out the front (according to Quentin’s checklist), the whole class would read the completed sentence. If students at the IWB struggled with the ‘correct adjective’, the teacher would ask them ‘what makes sense?’ and ask them to read it aloud to see if their ‘guess’ made sense.  Other. The teacher directed the whole session. There were frequent questions directed at the students. The games were played as a whole class - the speakers provided the sound / voice-overs and also seemed to help some students focus on the task. E.g. students listened carefully to the feedback given in the first ‘fill in the blank’ exercise.	Quentin / Darcy (Observed)
<b>16. Science / HSIE. Yr 5.</b> Students researched aspects of rainforests via the Internet and an interactive multimedia learning object ( <i>Rainforest: explore the rainforest</i> ) from TLF. They then presented their findings on the IWB in PowerPoint (Catie also used the IWB as an instructional tool during / after these presentations).	Catie / Ridges (Discussed)
<b>17. HSIE / English. Yr 5.</b> Students will learn about writing by comparing texts and then editing a piece of written text using the tools available in MS Word. <i>Outline.</i> This class began with the students seated on the floor in front of the IWB. Students brainstormed their knowledge of the water cycle. Following this, they viewed a movie clip which explained the water cycle in an engaging way. The students’ knowledge was then reviewed by the teacher who asked questions before moving on to “another way of learning about the water cycle”. This “other way” involved viewing a solid body of text with no subheadings, graphics etc. Students were asked their opinion of the text in its current state – some liked the purely text based information, others the visual movie clip. The teacher asked for suggestions about what could be done to make the body of text easier to use. Suggestions of font, borders, bolding keywords, inclusion of images, animations, a glossary and sub headings were made by the students. Students came up to the IWB and made relevant additions using the software tools. The teacher then drew the comparison between the body of text the students edited and the way newspapers present information. Discussion of techniques followed. The teacher then set the next activity which involved the students working in pairs on modifying the water cycle text so that “people would want to read it”. For this activity the students moved to their computers, which were organised into pods.	Catie / Ridges (Observed)
<b>18. HSIE / Maths. Yr 4.</b> Evie described a lesson she had conducted as part of a unit on shopping. The specific topic was <i>Who will buy?</i> She set the context of buying flowers for a wedding and used the Internet to go to the Sydney flower market web site and to online shopping sites. She also purchased an item on eBay and commented that this was a highlight for the students. Evie also integrated Maths into this activity. Following	Evie / Ridges (Discussed)

<p>this, students suggested designing their own online shopping centre. This idea formed the basis of a future IWB activity. Evie's students commented on a similar activity: "We did pretend shopping for a school canteen ....we had to restock the canteen ... we had a budget. It was really fun."</p>	
<p><b>19. English. Yr 4.</b> Students learn about conjunctions and their use in a piece of text.</p> <p><i>Outline:</i> Students were seated on the floor in front of IWB. The teacher conducted the lesson using the IWB and laptop. The lesson began with the teacher referring to a previous discussion of festivals particularly the <i>Indian Festival of Colours</i>. Sites on the festivals were found on Google. The teacher then read from a book on festivals noting the use of conjunctions in the text. The passage was reread without the conjunctions, discussion ensued on the effect this had and how conjunctions added to a passage. The teacher showed further examples of conjunctions using the IWB and then set task: un-jumbling the conjunctions displayed on the IWB. Students returned to desks and completed the task. The 'right' answers were checked towards the end of the observation periods. Evie commented the IWB "lets you approach the outcome from a different perspective and often 'catches' [hooks] children [that] more conventional lessons miss".</p> <p><i>Other:</i> Evie had a very firm belief that students should not be concerned about making mistakes. She felt everyone, including herself should make a mistake at least once a day and she openly acknowledged her own errors in front of the class. Positive reinforcement was a feature of this lesson.</p>	<p>Evie / Ridges (Observed)</p>
<p><b>20. Maths. Yr 4.</b> Topic: fractions, percentages and decimals. Students will review and relate concepts in fractions, percentages and decimals.</p> <p><i>Outline:</i> Students seated on floor in front of IWB. Teacher directed the lesson using the IWB and laptop. Lesson began with teacher revising fractions and students completing orally the examples written on the IWB by the teacher. Teacher then moved on to percentages completing orally the examples the teacher had previously put together. Again this was completed as a class group. Teacher introduced a TLF learning object – <i>Design a School</i> which involved using percentages and fractions. She worked through the object with the students calculating the required percentages etc. Teacher set a new task – students to design their own school. <i>This had been an idea suggested by one of the students in the class.</i> The lesson observation finished before any of the student work could be viewed. Evie's students commented in their interview: "...designing a school was fun. Lots of people got involved, made decisions as a class (on the IWB). Then they had to a go at doing it ourselves" (on paper).</p> <p><i>Other:</i> "Initiate, response, evaluate" pattern of communication with teacher initiating and evaluating throughout the lesson. Teacher-centred, students responded to questions. Teacher questions were closed, but did reinforce the understanding of fractions and percentages.</p>	<p>Evie / Ridges (Observed)</p>

<p><b>21. Science. Yr K.</b> Donna discussed a lesson she had conducted on telling the time - the students were able to manipulate the hands of a clock (using the IWB) as part of their learning. Donna's students recalled this task during their interview. One of their favourite tasks was 'learning to tell the time'. It was unanimous that learning how to tell the time was "better" on the IWB ... it was seen as being more flexible than using a real clock. "You can start it when you want ... and a clock is heavier!"</p>	<p>Donnna / Ridges (Discussed)</p>
<p><b>22. English. Yr K. Topic:</b> nouns verbs and adjectives. Students will review and discuss these parts of speech <i>Overview:</i> Students seated on floor in front of IWB. The teacher began with revision of nouns, verbs and adjectives. Each was discussed with students giving examples prompted by the teacher. These examples were written on the IWB by the teacher. During the discussion of verbs, students were asked to stand as a group and demonstrate each word e.g. jump, skip. Revision continued using IWB software. Using the software students came out and moved the nouns, verbs or adjectives to the appropriate column. Each word or image was read/identified before the students placed it into the correct columns. Positive reinforcement was given to each student – all 15 students “had a turn” and it was fine for students to give wrong answers. Some students read the words without being prompted by the teacher. This activity was also interspersed with physical activity. Students were engaged in the activity and particularly enjoyed manipulating the images on the IWB and the physical activities which accompanied the learning/revision of nouns, verbs and adjectives.</p>	<p>Donnna / Ridges (Observed)</p>
<p><b>23. Business Studies Yr. 11</b> <i>Overview:</i> The lesson started with students 16 students seated in a 'U' shape with Geraldine at the front near the IWB (IWB and computer on trolley). Geraldine re-capped on previous lesson using the IWB. She discussed the product-testing from a previous lesson and used the IWB to 'remind' students of the findings from that lesson. This included images of Coca-Cola. The next part of the lesson related to marketing products in the supermarket context using digital images taken that morning in the local supermarket. The images were very clear on the screen. Students were asked to compare product quality, pricing and position using a table. Every student used the IWB once during the lesson. Geraldine circled elements of the diagram on the IWB to illustrate points. There was a high level of discussion, teacher/students and students/students. Geraldine used questioning to elicit high order thinking and made suggestions to assist with the connections.</p>	<p>Geraldine / Hidcote (Observed)</p>
<p><b>24. PDHPE. Yr. 7 Water Safety</b> <i>Overview:</i> There were 30 students seated in a double 'U' shape with fifteen computers around the perimeter of the room on benches. Hannah started the lesson by looking at images on the IWB. These images were of risky situations in relation to water safety. She discussed water safety, risk-taking and precautions. From this students were asked to suggest the topic for the lesson. Hannah wrote their answers on the IWB and posed questions to develop the topic. Students then voted on the topic. In the next part of the lesson Hannah used a learning object (Jack and</p>	<p>Hannah / Hidcote (Observed)</p>

<p>Jim's Amazing Adventure on Lifesaving). She posed questions in relation to specific scenarios and chose a student to put the answers (from the class) on the screen by dragging. Hannah questioned students when they gave answers so that students had to justify giving particular answers. The chosen student introduced the problem scenario, whole class was invited to suggest answers and the student chosen dragged the answers to the particular scenario. The chosen student then asked the whole class to vote for the answers. After the class discussed the scenarios, Hannah highlighted the major points raised during the lesson and used the IWB to record the major points and to sum up the lesson.</p> <p><i>Other:</i> Various strategies were used throughout the lesson: voting; explaining answers and clarifying in response to Hannah's questioning; giving reasons for choice; students were encouraged to discuss the answers given. Hannah guided the answers and directed attention to the points raised. There was lots of problem solving because of the scenarios raised. The use of learning objects on water safety worked well on IWB as students could come up and manipulate choices by dragging and whole class could see outcomes.</p>	
<p><b>25. PDHPE. Yr. 7. Taking risks</b></p> <p><i>Overview:</i> 30 students seated in double "U" shape as previous lesson. Hannah reminded the students of the previous lesson in regard to taking risks in the water. Hannah used PowerPoint on IWB to show an image of a motorcyclist and a child and asks class to suggest reasons why people take risks. Hannah used questioning of students to clarify their answers. Two more scenarios from PowerPoint slides were displayed on the IWB and these had positive and negative questions included in relation to risk taking. Hannah led a class discussion through questioning and moving between the scenarios on the IWB to get the students thinking. Hannah referred to the first slide to show how the responses fit with the questions posed on slide 3. Hannah then explained the task for students. In pairs they had to develop a storyboard that involved someone taking risks. Students were given 6 frames in their workbooks to draw the storyboard. Students were told that the first group finished would be able to put their storyboard on the IWB for the whole class to view. Hannah moved between groups to encourage and support the storyboard constructions.</p> <p>The first pair finished drew their storyboard on the IWB. Hannah drew an extra frame for them. One student drew on the IWB with the pen and then touched the screen to move to the next screen (Hannah demonstrated this to the student). Class discussed the first storyboard then 2 more pairs were able to also draw their storyboards on the IWB. Each group explained the scenario to the whole class and then the drawing was erased.</p> <p>Students appeared very engaged, and were eager to display their storyboards on the IWB.</p>	<p>Hannah / Hidcote (Observed)</p>
<p><b>26. PDHPE. Yr. 7. Drug Education</b></p> <p><i>Overview:</i> Students do advertisements for various things, such as alcohol and PP presentations using the IWB. Their advertisements give expert advice and this is referred to as 'My TV'. There is also a problem scenario linked to the advertisement and advice. Her students listed this</p>	<p>Ingrid / Hidcote (Discussed)</p>

task as one of their favourites.	
<b>27. PDHPE. Yr. 7. Nutrition</b> <i>Overview:</i> Students play games such as ‘Jeopardy’ and ‘Who wants to be a food-aire?’ Students sit in the ‘hot seat’, they design the PP slides and they ask the questions.	Ingrid / Hidcote (Discussed)
<b>28. PDHPE. Yr.9. Body Image</b> <i>Overview:</i> Students seated in double ‘U’ shape (same classroom as Hannah). 30 students. Lesson began by Ingrid discussing and demonstrating how to write on the IWB. Students were invited to individually practise writing on the IWB by using their word processed hard copy to fill in the words (cloze passage) on the IWB. Ingrid oversaw this activity by remaining physically close and by guiding them with questioning. Students were encouraged to experiment and to use different colours and to practise rubbing out. Whole class enthusiastic about the outcomes when each student had a turn. When students were not writing on the IWB they were writing the answers on the hard copy. Ingrid put up a screen with information about body image and asked a student to read the text. Ingrid briefly explained the text as it was read. Ingrid present PowerPoint slides with different body images of celebrities and students were asked to give ‘thumbs up’ or ‘thumbs down’ for good body shape. Individual students were asked for their reasons for their choice. Ingrid discussed where we get our ideas on body shape and asked relevant questions to elicit responses from students.	Ingrid / Hidcote (Observed)
<b>29. English.</b> Students built an English mindmap created in class. Students filled it in and Annette then sent the product to everyone via email. Appeal is in ease of transference of material. “If have PP presentation can’t change it on the spot, but with IWB, could change it in class.”	Annette / Bayview (Discussed)
<b>30. Computing Studies. Yr. 12.</b> Val did a video conference using the IWB. Val spoke to a teacher in Canada using Skype and Google chat! She also used a Thinkpad, speakers, laptop and communication devices with the IWB	Val / Bayview (Discussed)
<b>31. Computing Studies. Yr. 12.</b> Two components of course: multimedia and automated manufacturing processes. Doing multimedia at present. Students had to choose one of a number of components – virtual reality, audio, Internet, animation and video, research and present on one. <i>Overview.</i> Seven students showed presentations. Students were very competent at using IWB. One student read from the monitor of the computer so that he could face the class (turned the monitor to face him). Another student underlined title with pens as he waited for us to get ready. Also circled text on board to draw attention to it. These two things couldn’t be done with other media. Also showed movement through links, movie, plus using pens to circle and underline. Val asked class questions about their presentations. After presentation students shared them on a memory stick. Students were generally attentive and seemed to enjoy each other’s presentations.	Val / Bayview (Observed)
<b>32. Computing Studies. Yr. 12.</b> Lesson on logic gates (electronic circuits which combine digital signals according to the Boolean algebra). Students will develop logic gates concepts	Val / Bayview (Observed)

<p><i>Overview.</i> Students working in groups of 2 or 3 at the computers (one at the IWB), were asked to complete circuits via an interactive Internet site and knowledge from previous lesson. When it became clear that the students needed some revision, Val discussed and demonstrated schematic symbols of the basic gates and logic truth tables using both the IWB and the traditional whiteboard: <i>e.g.</i> how to create the circuits; how to test them; how to create truth tables.</p> <p><i>Other:</i> Val walked around the class giving assistance where required. The class as a group was able to observe the IWB group as it worked on each circuit.</p>	
<p><b>33. Legal Studies. Yr. 11</b></p> <p><i>Overview.</i> Putting images in and annotating them. Will wanted to use a capture tool, eg get map, look at Africa. He started with an atlas, asking the students: “where are there areas of conflict?” and mapped the colonial empires. Will also Googled some images from Vietnam War – some iconic images – ‘doing media as it portrays conflicts’. Also used some pictures of Iraq. Will then discussed these images.</p>	<p>Will / Bayview (Discussed)</p>
<p><b>34. Business Studies. Yr. 11.</b> Students developed understanding of business functions</p> <p><i>Overview:</i> 11 students in class. Will used the whiteboard and trolley with laptop and data projector.</p> <p>Whole class ‘lecture style’. Will introduced topic, discussing business functions (operation, marketing etc.) ... (whole class) notes and discussion. Students were expected to copy notes from IWB during the lesson. Will was centre of lessons, however, students got opportunity to interact by writing own defns. Will did questioning re understanding. Will also wrote on board next to the labels. Not much discussion or questioning was used in lesson, lots of teacher talk and input via board.</p> <p><i>Other.</i> Will used scrolling function on IWB. Will pulled down screen with finger as needed – i.e. by dragging finger across bottom of part showing. Four pages were prepared using the IWB software. In discussing business functions (operation, marketing) Will use concept circles. Moved circles so they interrelated concepts. Will did the rearrangement of ovals much more easily than can be done on computer by dragging them to the right place with finger. Added arrows without difficulty. Some use of pen to highlight additions to prepared notes, students’ responses – quite effective in ‘distinguishing’ from default text.</p>	<p>Will / Bayview (Discussed)</p>
<p><b>35. English. 10 class.</b> Literacy lesson in spelling, reading and writing.</p> <p><i>Overview.</i> Floor space for whole or pair/individual class activities in front of the IWB. One designated computer at the teacher’s desk, connected to IWB, speakers connected to the computer, internet access, overhead projector, traditional whiteboard on wheels, student work displayed around the room. Students were seated on the floor in front of the IWB with their teacher and teacher’s aide at the IWB, lesson began with students introducing themselves, then proceeded on to knowing the date, time, month. Weather activities followed. Students then ‘broke off’ into different tasks - some students started to write their news in workbooks with the support of the teacher’s aide, some read to their teacher and wrote collaboratively on the IWB, two of the older students</p>	<p>Mary / Sheridan (Observed)</p>

<p>worked independently on antonyms on the IWB, one student worked on a number matching games. The learning was teacher led, clear instructions were given at regular intervals through the morning – this direction was readily followed by the children. Each time the IWB was in use, these students were highly engaged.</p> <p><i>Other:</i> Low mounting of board means it is readily accessible to children who are physically impaired. Mary constantly moved from the floor to the IWB, to a desk then back to the IWB, then to another child who had gone to wash their hands. Attention span is an important issue in an IO class; the IWB seems to extend this span in Mary's experience.</p>	
<p><b>36. English. Yr. 6.</b> Lesson on nouns – common and proper.</p> <p><i>Overview:</i> 28 students: desk in rows running the width of the classroom, light from window reflecting onto the IWB, no space at front of room, computer to one side connected to IWB, internet access. Lesson began with students seated at their desks facing the IWB, commenced with teacher-led revision of common nouns, students identified different types of nouns using the software's hide function, students circled words on the IWB using the pen, various resources used by the teacher. Questioning sequence was closed; teacher used it to develop students' conceptual understanding of a grammar rule. No formal assessment was required, questions asked of whole class and individuals answered. Unfortunately, some students were not engaged as they could not see the IWB properly.</p>	<p>Natalie / Sheridan (Observed)</p>
<p><b>37. English. (Nine K-5 students). Phonetics.</b> Joint construction of text, in this case film. Older students supporting younger students with their reading and handwriting.</p> <p><i>Overview: First session of the day:</i> Phonetics revision using <i>Jolly phonics</i> on the floor with students gathered around a small magnetic board. It is also a matching activity with each student having a turn. Blending the learning – sounding out the words, she asked other to jointly construct the sounds. Students moved to their desks from the floor – the desks are in a U-shape facing the IWB (which is mounted so students may easily access it) at the end of the classroom. Younger students practised their handwriting with the older students. Some students were doing a cloze passage on the IWB. Leah works with individual students on reading or bookwork.</p> <p><i>After morning tea:</i> Recount- what? Where? Who? When ? – uses the IWB to effect this process. Teacher led discussion of script and film activities undertaken during the previous days with a visiting author. Decisions around: the story to be filmed, writing the stories, taking the pictures. Responses given by students to the teacher's whole class questions – they were expanded upon by further questioning to determine conceptual understanding</p> <p><i>Other:</i> Motivation and stimulation of students was maintained. The pace of learning with the IWB at Kirkland was different to other school contexts seen by researchers. The pace sped up from time to time when activated by the teacher using prompt questions on the IWB.</p>	<p>Leah / Kirkland (Observed)</p>

#### **4.4 Conclusion**

In this chapter we have presented sample lessons from the study together with their links to the Quality Teaching Framework. Many of the teachers in the IWB study mentioned this framework as being instrumental in their teaching and we saw evidence of this influence in their use of the IWB, particularly elements from the *Quality Learning Environment* and *Significance* dimensions. The *Engagement* and *Connectedness* elements were particularly noticeable in both the case and online survey data, suggesting that use of the IWB can enhance these elements in classrooms. Elements of *Intellectual Quality* were not as predominant, although a longer term study would be necessary to investigate this dimension.

A summary table is provided in this chapter, with outlines of all observed lessons, as well as descriptions of some lessons which were described to us. Major findings are presented in the next chapter.

## 5 Findings

The following framework was developed by the UTS researchers as they individually worked through the six case studies using an interactive reduction mode of data analysis (Miles & Huberman, 1984). They initially noted findings from each case in different categories that appeared to explicate the research questions. The two researchers met after a first draft of their frameworks had been developed, and discussed how they differed or overlapped. Some changes were made to each of the individual frameworks so that from this point on, both researchers were using the same framework. However, it remained a dynamic process in which new themes were added when a finding did not fit existing ones and some themes were eliminated in later meetings as they could be subsumed in other themes.

The data are grouped under three research themes, which arose from the research questions described at the beginning of the report. The questions are repeated here:

1. What do teachers and students see as the value of using interactive whiteboards in lesson designs and what beliefs do they hold about this technology and its relationship to learning and teaching?
2. What is the role of the school in promoting use of the technology? What other contextual factors constrain or enhance the use of this technology in teaching and learning?
3. What learning outcomes are supported by the use of interactive whiteboards in various Key Learning Areas? What learning tasks are associated with these outcomes?
4. What pedagogical approaches are being used with this new technology?

Questions 1, 2 and 4 are discussed in this chapter and question 3 was discussed in chapter 4, with reference to the NSW Quality Teacher Framework (QTF).

### ***5.1 What do teachers and students see as the value of using interactive electronic whiteboards in lesson designs and what beliefs do they hold about this technology and its relationship to learning and teaching?***

In general, school leaders hoped the widespread use of IWBs in their school would be a vehicle for teachers to think more deeply about their teaching and would also act as a conduit to the integration of ICT across the curriculum. Teachers spoke enthusiastically about the convenient and flexible nature of the IWB and believed it enhanced visual and tactile learning experiences for their students. They spoke positively of enhanced ownership and indeed, students' views supported many of these perceptions.

The major sources of the data interpreted in this section were interviews with the principals, executive staff and the participating teachers. Students' views were ascertained from focus group interviews. Some data from the online surveys is also presented (see also Appendix 1.6).

#### **5.1.1 Catalyst for teacher learning**

School leaders were adamant that the introduction of IWBs into their school would help teachers to reflect on and develop their teaching. The Principal of Darcy

PS believed that the IWBs were part of helping teachers in his school conceptualise learning and ways that ICT might be integrated into learning. Jacqueline, principal of Hidcote GHS, thought the ease of use of IWBs was a major reason for their success in providing a catalyst for professional learning to occur. She believed that teachers starting out with IWBs in her school quickly started looking (through her school's Professional Learning Committee) for deeper, more sophisticated ways of using them, leading to an enriched curriculum. Similarly, the principal of Sheridan PS expressed pride in changing the culture of teaching in his school because of the IWBs: "The project is not about the IWBs, but about learning styles, modeling practice and developing confidence with ICT." He saw the IWB as a way of melding traditional classroom interaction with computers and the QTF. Teachers had similar beliefs. For example, Samantha (Darcy teacher), was very confident and experienced with learning technologies. She said she enjoyed learning about the IWBs by using it and exploring new uses across the curriculum. "The more I use it the more I learn; it's just self-discovery".

Many teachers told us that their use of the IWB had renewed their enthusiasm for teaching. As well as appreciating the educational benefits, Will (Bayview) perceived the IWB as a welcomed new tool to use in his classroom after 20 years using blackboards. Natalie from Sheridan, told us "It gives older teachers like myself 'a new lease of life'!" The passionate remarks from one teacher in the online survey were typical of many teachers' comments: "I have found the IWB to be the most innovative and exciting thing to happen in education and technology for years...It's put a spark back into my teaching too!"

Although most teachers in the project were confident technology users, they expressed enthusiasm about further developing their ICT proficiencies through the use of the IWB. For example, IWBs were new to Rosemary (Darcy); the principal had recently introduced them to her. She liked to learn by playing with the technology: "I'll just stay back one hour and play around and try and learn something new myself that I can give to them." She has always tried to use ICT in her teaching. She said that since she started using the IWB, she is now more inclined to look for interesting resources (eg. via web sites and also use of the scanner). She is now more aware of web-based resources; she will see something [on the web] and think, 'I can use that (easily!) and download it'. Donna (K teacher at Ridges) preferred more formal avenues for development. She attended courses and training and development to further her ICT skills "so I keep updated" and maintains currency with ICT by attending training and development courses and "keeping an open mind about technology".

### **5.1.2 Congruency with teaching philosophy**

Teachers expressed a range of teaching beliefs. They tended to use the IWB mainly in a teacher-directed fashion. There was a common perception that an IWB constitutes a teaching 'method' and many teachers used IWBs as a way of varying strategies for engaging students in lessons. As a result of observations, the researchers suggest that the teaching was usually congruent with an (unstated) teaching philosophy which held the teacher as central and authoritative expert.

### **5.1.2.1 Fitting teaching philosophy**

Catie (Ridges Yr 5 teacher) felt IWBs generally fitted her student-centred philosophy but also could be used as an instructional tool when needed. The lessons we observed from her indicated a congruence between her philosophy and practice (e.g. see Example Lesson 3 from Chapter 4). Rosemary (Darcy) also emphasised that she likes the students to work independently. For example, she likes the students to use the IWBs independently and she rarely leads them through the IWB work. She wants them to take responsibility. However, this was not observed in the lessons we saw – see lesson 8 from Table 4.1. Observed lessons were very clear, highly structured and students were guided through the steps of the lesson by the teacher, illustrating “authoritative” pedagogy as discussed by Kershner & Warwick (2006).

### **5.1.2.2 Enhancing learning outcomes**

Many teachers stressed they used ICT only if it enhanced learning outcomes. For example, in preparing for a lesson, Geraldine (Hidcote) looks at the content and the syllabus.

She also looks at the particular unit of work and intended learning outcomes. She also asks questions in relation to the way students learn, think and problem solve before deciding the best tools to use to enhance learning. Similarly, Evie (Yr 4 Ridges) emphasised "It [ICT] is not a philosophy it's a tool".

Indeed, part of her philosophy of teaching is that it is fine to make mistakes: "If you haven't made a mistake today then you're not trying or learning." This risk-taking environment was certainly evident during the lessons we observed (see lessons 19 and 20 from Table 4.1). Many other teachers emphasised their own ‘risk-taking’ attitude and how they liked to develop an ‘adventurous’ culture in the classroom using the IWB. (Although some children in Hannah’s and Ingrid’s (Hidcote) classes mentioned that they were concerned about making mistakes on the IWB, with everyone watching and the possibility of having their mistake ‘recorded’.) Samantha (Darcy) said her students feel they can achieve success as well as take risks in their learning. Natalie (Sheridan) encouraged her special needs students to come up to the IWB and write: “They know it’s OK to make mistakes and I have seen previously reluctant students take more risks with their learning, especially in subjects like HSIE”.

### **5.1.2.3 Technology as a ‘teaching methodology’**

Many teachers saw the IWB as a teaching method or technique and viewed the technology itself as a pedagogical approach. Rosemary (Darcy) mentioned: “The IWB is used in conjunction with other teaching methodologies!” Another teacher (Samantha, Darcy) said: “When I use the IWB, I have 100% engagement, including challenging students, from every single student ...unlike other teaching techniques I use”. Indeed, some teachers used the IWB primarily for variety and a change from the normal class routine. Teachers such as Ingrid (Hidcote) and Will (Bayview) selected ICT as a way of varying their classroom strategies and creating interest through this variation: “The use of ICT is not necessarily to enhance learning, more to make the learning more interesting...I like to vary the experience for students, so I will choose a strategy that is different and that they may not have used before” (Ingrid, Hidcote). Will (Bayview) also likes to vary his teaching approaches and hence, used a range of technologies primarily “to keep interest...” (Will, Bayview).

### **5.1.3 Support integration of ICT into curriculum**

School leaders and teachers viewed the use of IWBs as a way of easily integrating ICTs into the curriculum. The principal at Darcy mentioned: “The IWB ensures integration - it’s about technology in the classroom. IWBs are a means to the end of full technology integration – the role of the teacher is not explicit – it is a fully integrated learning tool.” He believed that teachers will not engage with technology unless they see a purpose, and his teachers were finding a variety of ways of using the IWBs to support meaningful learning. For example, Pam (Yr 5 Darcy teacher) mentioned how she likes to bring rich contexts into her lesson and the IWB makes this easy: “They allow you to do things that you’ve never been able to do before.” She described a recent lesson she did on negative numbers and the students asked her ‘how is this relevant’? She was able to pull up a weather program: “the whole class could see it ... it was large, it was interactive, they were able to see the negative numbers ...”. Indeed, one of the Yr 5 children from Darcy made an interesting observation that the IWBs had initiated more ICT-based tasks in their class: “We tend to use computers a lot more. Before the IWB, we only used it a few days a week.”

Teachers were generally excited to use the technology but stressed that they tried to use the IWB when appropriate. For example, Val, a computing studies teacher and pioneer of IWBs at Bayview stressed that she sometimes deliberately does not use the IWB. Although she ‘teaches technology’, she tries to keep the IWB seamlessly in the background: “I see a need not to make the technology the focus: a challenge when also teaching about technology!” Ingrid (PDHPE Teacher at Hidcote GHS) tries to incorporate ICT into everything she teaches as “students need to familiarise themselves with a range of technologies”. Like Will, she likes to vary the experience for students: “so I will choose a strategy that is different and that they may not have used before.”

### **5.1.4 Support of learner interactions and responses**

There was a strong belief that the IWB enabled a breadth of children to collectively respond to learning.

#### **5.1.4.1 Student input**

Val (Bayview) believed that using the IWB can help students to share ideas, be collaborative and enhance engagement and ownership:

The sharing of ideas is right ‘in your face’ ...you can have two or three students working on something on the IWB and ... the students are involved and they want to have their say, they want to have their opinions and feelings known about what’s going on the IWB. They own what’s going on. I have to stand back to a certain extent.

Leah (Kirkland) mentioned similar aspects when asked about the best lesson she had done this year with students using an IWB: “I can use the IWB to engage the older students by grouping them in different ways, they interact and take turns”. Quentin (Yr 2 teacher, Darcy) emphasised this aspect in his interview: “The biggest highlight for me is the actual interaction between the students and engagement of the students ...”

#### **5.1.4.2 Collective learning**

Quentin talked about the whole class use of learning objects via the IWB in his room: “...they’re actually doing it as a [bigger] group, I think they like to see each

other and work things out together and I think that's a big part of it as well!" He emphasised that this was the case especially for students with special needs.

Children at Darcy mentioned these aspects too. T (Yr 5 student) thought the IWBs were "Good for teamwork ... the whole class works together. You can pass the slate around". Some of the other students expanded on this teamwork theme and thought the Learning Objects encouraged cooperation. J liked the *Wish Ball* learning object: "You can talk to your friends and make decisions". C liked the learning object called *Catch a Thief* and thought it encouraged teamwork. C preferred the whole class using the IWBs as "...other people can help you make decisions". One of Evie's Year 4 students (Ridges) thought the visual affordances of the IWB helped children in her class to get involved and respond collectively.

### 5.1.5 Interactivity

A number of teachers viewed the (physical) interactive nature of the IWBs as paramount in their rationale for using them in their classrooms. Not surprisingly, many primary teachers emphasised the tactile nature of the IWB. However, only a few classes were using a slate and the stylus.

Samantha (Darcy) thought that IWBs were interactive because "The students have to actually touch the board; use a pen to actually write on the board." For example, in her lesson on writing, the students brainstormed words and wrote them on the IWBs. She thought the IWBs were more visual for students and more hands-on: "They can really interact with it ... the students love it!" Children from her class focus group supported these views. They also emphasised the visual aspects of the IWBs and the user-friendly input devices in their interview comments.

Samantha's colleague, Pam, emphasised the slate and the stylus as providing interactivity for the children. Children from her class agreed that there was a better 'feel' to the IWBs. For example, they mentioned the pen, clicking etc., and compared the normal computer input devices (mouse, keyboard) to the IWB: "It's easier to touch the icons. For example, on the Internet. It's also easier to do drawings."

Catie's (Ridges) remarks concerned her assessment of the level of interactivity. Catie stated that the interactivity of the IWB depended on how it was being used. For example, students could manipulate objects or the teacher could use it as an instructional tool. The ability to manipulate objects on the IWB was stressed by teachers such as Donna (Ridges), who emphasised the value of young students being able to manipulate objects on the IWB.

Ingrid (Hidcote) liked the opportunity to make lessons interactive for students: "You can use the IWB to do things that students have done in print form but it makes it more interesting for students to do it with an IWB, such as a cloze passage. It gets their attention and is more interactive than just writing the answers in a book (Ingrid, Hidcote).

The ability to dynamically manipulate and annotate objects on the IWB screen was emphasised by teachers. Hannah (Hidcote) chose to compare her work with IWBs with more traditional overhead projectors: "It is more interesting than a data projector because things are not static, they move and we can also move them." Indeed, her colleague, Ingrid (PDHPE teacher, Hidcote) appreciated that the IWB could do clever dynamic-type things such as helping the user to draw graphs and arrows and print them off. Peter (Bayview) also appreciated the malleability of his IWB (teacher produced) presentations. He mentioned: "An advantage of the IWB is

that you can manipulate stuff like a concept maps ... you can annotate and change objects. ... Instant annotations are flexible.”

### **5.1.6 Immediacy and convenience**

A strong theme to come through with the teachers’ rationales for using IWBs was the convenient and flexible nature of the tool in a busy classroom. These affordances saved time in the classroom, allowed a variety of resources to be brought into the classroom more easily and created a more visually supportive lesson for students. Interestingly, not as many teachers mentioned the record function and the ability to assess students’ work or re-use tasks. Francine (Assistant Principal, Darcy) summarised these affordances:

...it’s the immediacy for students. There is no time lost.....e.g. if I want to demonstrate something ... it’s there and they can see it. Students are so visual and they love that they can see it. It’s happening there before them. I don’t have to go to my computer to show something, I can operate it standing at the front ... it’s there at the touch of the screen!

There was a strong emphasis on the increased pace of the lesson resulting from this ability to quickly access materials on the IWB. Samantha (Yr 4, Darcy) said “It’s a lot easier and quicker way [for her and her students] to do things in the classroom.” She also liked that her lessons could be modelled and edited visually. Her students confirmed this view. They recognised the convenience of the IWB for their teacher, noticing: “If the teacher finds something really interesting, she can share it easily”.

Indeed, Catie (Yr 5 teacher, Ridges) described the IWB in her classroom as a portal, allowing her to draw on resources from a variety of areas in a short period of time. Bernice (Relieving Principal, Ridges) strongly believed that lessons mediated by an IWB progressed at a faster pace: while Hannah’s students (Hidcote) had similar perceptions. In their view, their teacher ‘packed more into the lesson’. Val (Yr 12 teacher, Bayview) expressed similar views but from the perspective of students using the IWB for class presentations: “It’s instant! They can lift up [their presentation] with a finger ...”

The ability to review parts of the lesson also was seen as a major convenience. For example, Natalie (Sheridan) said: “The fact that you can store what has been done and re-visit is a huge advantage.” Hannah (Hidcote) found the ability to quickly revisit and summarise material at the end of the lesson advantageous: “...you can re-visit the pages at the end of the lesson to sum up.”

Children also appreciated these aspects. One of Catie’s Yr 5 students (Ridges) said: “...when researching you can go back and see what you need to do ...can go back to past slides”. They said that an overhead projector would be too cumbersome; with IWBs “it’s all there for you....you can start straight away”. Geraldine’s students (Hidcote) also appreciated the recording function: “You can go backwards and forwards, swapping pages and see the teacher’s answers and our answers and compare them.”

### **5.1.7 Visual aspects and enhanced presentations**

Most teachers and students stressed the visual impact of the IWB in their classrooms. The K-6 teachers in particular talked about the provision of bright, colourful and appealing images and contexts for their children. Few teachers were utilising the audio facilities, although some teachers had plans to utilise audio

projection capabilities for music education topics. Some teachers emphasised the presentation affordances of the IWB as a main reason for using it.

Val (Bayview) made the following analogy to emphasise the visual (and tactile) nature of the IWB: "...also there is the visual aspect – everyone can see it... At the end of the day, it's [the IWB] like a giant graphics tablet!".

Samantha, (Darcy) liked the way her lessons could be modelled and edited visually while Catie (Ridges) thought these visual benefits provided an opportunity to bring more context into the classroom. She commented that the IWBs provided the students with "as close an experience as you can get rather than just 'a picture from a book'. For example, she mentioned that students may not have an experience of rainforests but the IWB can bring these (still and video) images into the classroom. Catie reiterated the visual impact of IWBs on several occasions. Indeed, her Yr 5 students also commented on this visual nature of the IWB in their classroom: "You understand more what to do... you can see it clearly and the teacher can help us if we do it wrong. It also helps slow students keep up".

Students from the same Yr 5 age group at Darcy liked the tactile and visual aspects of the IWBs and this enhanced their perception that work done on the IWBs was very different to their normal pen and paper-based work. Indeed, Geraldine's students (Hidcote) were adamant that the visual imagery enhanced their ability to review concepts taught in class: "You remember more than when reading from textbook. What we learn in the IWB lessons stays with us. When we think of a concept, we recall the image we have seen on the IWB." Only two students (from Samantha's Yr 4 class at Darcy) spoke about audio aspects of the IWBs. They particularly enjoyed listening to information: "You can listen all about it ...information on human systems". Another agreed: "I like listening to information on convicts."

Some teachers mentioned enhanced presentation aspects as the prime reason for their IWB use. Will (Bayview) thought IWBs allowed him to make clear presentations to his Yr 11 Business Studies students. He created a skeleton document to develop in class and then print off for his students. He also constructed mind maps and was impressed by their professional appearance. As well, one of the teachers from the online survey liked how the IWB could provide visual support for her explanations: "I find it to be a powerful tool in engaging students in the lesson and I am able to explain mathematical concepts far more easily using the graphics that are available with the computer format." Yr 5 students from Darcy liked the professional way their teacher could write and draw to supplement her explanations and show interesting information from the Internet. Similarly Hannah's students (Hidcote) liked viewing the IWB because information was presented in an attractive way, and the teacher can circle and underline things for the students to see.

### **5.1.8 Embraces children's digital culture**

Many teachers believed that use of the IWB in their class would help their technology-savvy students feel comfortable and confident in their learning environment. They also were considerate of developing their students' technical skills for a technology-based society.

A few teachers made the link between the visual aspects of the IWB screen and students' TV and game leisure activities. Evie (Ridges) thought her students' familiarity with television helped them feel comfortable with the IWB: "...having a big screen up there ... they're in their element ... it's a big way for them to learn." Similarly, Geraldine (Hidcote) thought "using IWBs provides an extra interest in

keeping with all the media with which students are bombarded.” Some student comments backed up these perceptions. For example, Leah’s students (Kirkland) said their favourite use of the IWB was for ‘seeing movies’ while Geraldine’s students (Hidcote) said they most enjoyed watching excerpts from videos to bring real context into their lessons. For example, they looked at a *Sound of Music* clip to view the alpine setting in a Geography lesson.

Mary (Sheridan) recognized that ICT is one way many of her students entertain themselves at home with technology-based games and other media. She wanted to build on their confidence: “I need to provide them with the knowledge and skills to access the technology available, and strategies to identify and discern decisions about use. For example, communication such as mobile phones and emails.” At Sheridan, the principal believed the students were driving the change towards use of IWBs and other ICTs: “My expectation has increased enormously around what the students are capable of doing, maybe it is about exposing and privileging their technology prowess”.

Many teachers wanted to sufficiently immerse their children in technology because of its prominent role in ‘everyday society’. For example, Catie (Ridges) commented that ICT is an everyday part of life in our society and she therefore had a responsibility to prepare students for that. Similarly, Donna believed “technology is all around the student’s world so why not educate and expose them to everything possible to make their lives easier”, while Ingrid (Hidcote) wanted to expose students to ICT and help them familiarise themselves with a range of technologies.

### **5.1.9 Engagement**

There was a strong perception from teachers and school leaders that students were more engaged in their learning tasks due to the use of the IWB. Pam (Yr 5 Darcy) believed that the IWBs in some ways ‘disguised’ hard work and learning for the students and this was backed up by her students’ comments: “It makes you want to learn. It’s a lot easier than writing everything down in a book”, and “It’s making us learn ... it’s fun and animated ... it’s like a game ... you don’t realise that you’re actually learning something!” Like her colleague, Samantha (Yr 4 Darcy) thought her students enjoyed the IWB and perceived their use of the IWBs as a game, or at least different from their more usual pen and paper-based work.

Many teachers made similar ‘enhanced engagement’ claims about previously unmotivated children and ‘reluctant learners’. Pam (Darcy) confirmed that previously ‘difficult to manage’ students had become involved in lessons where she uses the IWB: “They can become involved in what they’re doing; they take turns ... [it also] maintains their concentration. I’ve seen students become engaged when they haven’t been engaged before.” Hannah (Hidcote HS) believed that using IWBs had helped her ‘reach’ those students who are not usually engaged. Her students hinted that the visual aspects were one key to this enhanced engagement: “We focus more, pay attention more, not just listening, but also looking.” While Geraldine’s students thought the IWB made “you think about the question before giving an answer ... makes us think to get definitions, not just copy down.”

In many cases, these findings could be at least partially attributable to a novelty effect as the technology was still relatively new to the students.

### **5.1.10 Enhanced student ownership**

Another possible reason for the increased engagement of learners (see previous section) was the enhanced levels of ownership by learners. Students enjoyed

the opportunities to 'have a turn' on the IWB, share their ideas and be collaborative during class discussions; and also project their own work. Teachers such as Geraldine (Hidcote) saw these new levels of ownership as another reason for the high engagement levels discussed earlier: "It is good for students who are less successful because they have ownership and see that it is fun [learning is fun]." Some teachers reported that students in their class were driving new uses of the IWB in their classes.

Quentin (Darcy) insisted that his Year 2 students' levels of ownership of the IWBs were high: "... they want to explore its uses ... they want to see what it can do next..." Rosemary (Darcy) agreed: "There are more suggestions coming from students...and comments from students since the IWBs came into the room". She was comfortable with the students teaching her and driving the IWB use and she liked the student enthusiasm, initiative and responsibility associated with her use of the IWBs: "... the students are teaching me! They come up with lots of good ideas. They are taking responsibility for it". Indeed, the principal at Darcy recognised this unusual 'push' from the students in driving use of the IWBs in the school: "The students are driving the change, but the teachers are catching on – which is refreshing." Online survey comments were similar. For example, one teacher mentioned: "...I cannot keep the students away from the board. They are finding ways to do lesson activities so that the board can be included in the activity."

Teachers also liked the enhanced opportunities for their students to project their own work, increasing learner ownership. Pam (Darcy) said a lot of her students are 'exhibitionists' and hence liked to use the whiteboard for 'projecting' their work and their thinking. Francine (Assistant Principal at Ridges) observed the benefits for quieter students in her class: "Shy students now want to share and present their work...The (Stage 3) students are far more willing to present in front of each other". She believed that the visual 'prompting' of the IWB was an important factor here: "Students that would struggle giving a presentation of a few sentences are more comfortable ... they're just freely talking because they've got this visual prompt behind them". Ingrid (Hidcote) found the same phenomena with her PDHPE students: "You can encourage the quieter students to come to the IWB and write in their answers, rather than having dominant students always calling out the answers".

We observed Year 12 students making presentations in lessons at Bayview SSC (e.g. lesson 31 in Table 4.1). These students later expressed how they liked using the IWB to address the class as "you're not 'stuck' in front of a computer". As well, Val (these students' teacher) mentioned a student who had been struggling with literacy earlier in the year, but had presented his work on the IWB with great confidence. However, one teacher still did not allow his students to use the IWB as he was concerned they might damage it.

### **5.1.11 Summary**

The major findings in this section are that principals and school executive saw the value of the IWBs as being a catalyst for teacher learning, reflection and ICT integration into the curriculum. Teachers appeared to enjoy using the IWBs mainly due to a congruency with an often unstated teaching philosophy. Others stated that they only used the IWB if it fitted with the lesson's learning outcomes. Both students and teachers felt that IWB use encouraged interactivity, engagement and student ownership. Teachers commented on the convenient nature of the technology and the way that resources could be saved and brought easily into the classroom to provide visually attractive and current lesson material. Finally, both teachers and students felt

that the use of the IWB matched the technical skills and interests of their digital generation students.

## **5.2 What is the role of the school in promoting use of the technology? What other contextual factors constrain or enhance the use of this technology in teaching and learning?**

In all cases the principal was a driving force for the initiation of teaching with IWBs. Principals encouraged staff to use them, organised funding for purchase of boards and took a keen interest in their use.

The major sources of data interpreted in this section were interviews with the executive staff, the key staff members involved in supporting use of ICT in learning, and the participating teachers. School policy documents and observation data also were informative.

### **5.2.1 School Executive Support**

School executive support was offered in a number of ways. These are discussed below.

#### **5.2.1.1 Encouragement and inducement**

As noted above, principals were the driving force in the schools to encourage IWB use. They felt in the main that it was essential to encourage use in a sensitive manner that was non-threatening. However, a few did talk about using other strategies as well, such as the 'stick and carrot' approach, discussed in the next section. The principals at Darcy P.S. and Bayview Senior Secondary College both felt that an encouraging approach was the way to go, although the principal at Darcy also mentioned the need for pressure (see below).

Some of the comments that principals made in this regard follow:

- "I see that I need to 'sell' it to teachers, I do that sensitively and let them think and respond to the idea of ICT in learning at their own pace" (Darcy)
- "I drive the getting of useful ICT for the school." (Hidcote GHS)
- "My view is really about low key leadership in this area..." (Darcy)
- "I think by not ramming it down everyone's throat they will be more likely to take it on." (Darcy)
- Staff at the schools also commented on the way the principals had encouraged staff to get involved with this initiative.
- "Zach (the principal) is very skilful at creating time and opportunities for staff to 'play', become aware of and familiar with new technologies (eg. thinkpads, IWBs etc.). Next term we will use Thinkpads for awareness-raising. He wants people to play around with these. He will them in staff meetings." (A.P., Bayview)
- "The principal was far-sighted in encouraging staff to trial the Interactive Boards." (Mary, Sheridan)
- "The senior executive is helpful, especially the principal who is supportive and encouraging of ICT." (Hidcote)
- "Due to the quality of the professional dialogue in which senior executive staff endorsed IWBs as useful tools (and staff trusted their judgement), all staff are now eager to get the IWBs. Even when staff does not have easy

access to them and has to borrow them from other areas, they are willing to go to that inconvenience and trouble in order to use them.” (Hidcote).

- “There is a very supportive school executive” (Catie, Ridges).
- “Principal was responsible for the rollout of IWBs.” (Ridges).

#### **5.2.1.2 Pressure and support**

Some of the principals also used a mixture of pressure and encouragement to bring staff on board. They used the ‘stick and carrot’ and similar metaphors to describe how they cajoled staff into using IWBs.

For example, the principal at Darcy told us that he used a “mixture of pressure and support”. The principal at Sheridan used the metaphor of a bulldozer. He continued “The power-broking teachers were brought ‘on-side’, sometimes you have to plough through.” He told us that he was once asked at a merit selection interview what he would do if a teacher refused to have anything to do with computers; he replied that they would just have to be treated like a ‘pillar in the ocean’, they would just have to be ‘left behind’ as the ocean (of new technology) would just flow around them. He concluded that “computers are not a KLA so you either force teachers to teach IT skills as part of the KLAs or you take it out of their hands and employ specialist teachers to do it”.

The principal at Hidcote also mentioned the combination of pressure and support that was used to get staff to teach with ICT: “People are encouraged, supported and pushed to use ICT. They see that things are happening with ICT.” (Hidcote).

#### **5.2.1.3 Supporting pioneers**

Another strategy used by principals and school executive was the support of ‘pioneers’, that is, those teachers who showed an interest in the technology and led the way in its use. Principals felt that these people would encourage others to participate.

“The executive provides a learning environment where if the teachers come up with exciting ideas they are given the opportunity to do it” (Rydgcs).

“Zach is the reason for [our] success [as well as] the campus technology committee. He [Zach] has interested people in the use of IT and Zach is willing to provide required technology” (Bayview).

“He [Oliver] allows these people (power-broking teachers) to explore and then initiate other people into the next stage” (Sheridan).

At Hidcote, a teacher from a technology high school was approached to come to the school and head the Teaching and Learning Committee and drive the use of technology in pedagogy. “I take part as a leader in staff development days and provide support on ICT use. The senior executive is helpful, especially the principal who is supportive and encouraging of ICT.” (Geraldine, Hidcote).

#### **5.2.1.4 Initiatives to raise money**

Most of the schools had developed strategies for funding their IWBs. These initiatives had the full support of the executive and often were driven by the executive. For example, “We actually had a ‘type-a-thon’ to raise money for technology resources – it raised \$20,000 – this was all used for ICT” (Darcy)

“There is a high degree of support, both financial (resources) and professional learning”. (Hidcote)

“Zach, the Principal is brilliant .... Saves money for this use. Allocated money for IWBs. Large percentage of teacher professional learning (TPL) funding goes to [support] technology in the classroom.” (Bayview)

It was clear to the research team that in each of the case study schools, great enthusiasm, drive and support was available from the principal (or from the principal who was at the school at the time that the process was initiated). An important outcome of this interest by the principal was that resourcing was largely available for initiatives in the ICT area, provided that they could be seen to have a benefit for teaching and learning.

### **5.2.2 Key people driving and supporting use of IWBs in school**

In most schools, staff were at similar levels of expertise in using the IWBs and so there was little individual expertise to drive the use of the technology. Hidcote was the exception, as Geraldine was brought in from another school because of her technological expertise and excellence in teaching, and her role was to support staff in developing expertise. “The head teacher [position] of Teaching and Learning was created 2 years ago as a *catalyst for change*, [someone] who can *engage the confidence of other head teachers*. The head teacher of Teaching and Learning (Geraldine) drives a lot of the professional dialogue. This is significant and she promotes personalised learning. This helps to engage teachers in ICT.” (Principal, Hidcote)

Mary at Sheridan, felt she was able to support other teachers as well. “I already had background knowledge [about IWBs] as Special Education had been involved in the initial expressions of interest and I was keen to see them used in High School. I used a large amount of Special Education funds to have an IWB in my room and have encouraged other support teachers.” (Sheridan)

In general, the technology committee played an important role in the school. This was acknowledged by the principal at Darcy, and the acting principal at Ridges told us that the ICT committee developed a scope and sequence for integration of ICT, with ‘branches’ emerging as teachers worked with ICT. At Hidcote, this committee’s role is taken by the Professional Learning Committee: the committee is responsible for staff development days, and provides exposure and collaboration to enable staff to see what others are doing and how they are using ICT. The committee also looks at the use of ICT in relation to educational issues such as literacy through the application of technology.

At Bayview, there was a campus technology committee and a technology committee across the whole college. The campus technology committee was regarded as part of the reason for the school’s advances in technology.

### **5.2.3 Technical support person**

Most staff felt that the technical support they received in their school was good and that this made a difference to their usage. At Ridges, Astrid, the teacher librarian and head of ICT committee, noted that the software and hardware drove the direction of their use and adoption of IWBs in the school, to a certain extent. As well, the school’s General Assistant “is a blessing” particularly in regards to technical support. Other teachers supported this statement. “Excellent technical support from

the school's general assistant who dealt with any problem within a day." (Catie, Ridges)

The principal of Darcy felt it was important to have someone to back up the staff if the technology fails. He recognised that many teachers worry about lessons being disrupted if the technology fails.

Hidcote employed technical staff five days a week. The infrastructure is set up in such a way as to enable teachers with minimum technical knowledge to 'just turn it on' to get it working. "In much the same way as we all turn on the TV but have no knowledge of the technical side of the TV we are able to operate it just by turning it on. This is what I want the staff to be able to do, without having to worry about learning more than is necessary" (Principal).

The value of the technical staff was acknowledged by others. "The technology works because of the excellent technical support." (Geraldine, Hidcote)

Natalie at Sheridan felt that the lack of technical support hindered her use of IWBs and wished they could get more help.

#### **5.2.4 School resources**

All the schools we visited were well-resourced in a number of ways. Our discussion focuses on the set-up that existed with respect to IWBs.

##### **5.2.4.1 IWB infrastructure**

This section describes how the IWBs are set up in each school. However, it must be noted that although the descriptions below were accurate at the time of the studies, changes to the number and availability of IWBs was ongoing, so it is likely that these descriptions are no longer current at time of publishing this report.

At Darcy, the year three teachers were the first to use IWBs. Two IWBs were set up in term 2, 2005; four more IWBs came in term 3, 2005. The recent arrival of IWBs is noteworthy as our case visit was conducted in term 4, 2005 and teachers would have been in early stages of usage at the time of the visit. They would all been familiarising themselves as to how to use the boards. This would have had implications for the lessons that we saw. As well, this school was the first school at which we conducted a case study. The principal's goal was to have an IWB in every classroom by the end of 2005.

At Ridges, the school's experience with IWBs started with the purchase of two IWBs, which were mobile, one being used in the library and one available for booking by staff members. Teachers were able to trial them and their positive feedback resulted in more IWBs being purchased. One was placed in a Stage 3 class in 2004 and this was expanded to all Stage 3 classrooms in 2005. This earlier access to boards was probably responsible for the well-developed lessons using the IWBs, that we observed during our visit in late term 4, 2005. One of the kindergarten classrooms also had an IWB at time of the visit. Each classroom that housed an IWB has a designated computer at the front of the classroom with a synchronised system that allows the teacher to view the work of individual students and pull up their work to display on the IWB. There also were two classrooms equipped with student desktop computers arranged in pods (for example, Catie's room - see lesson 17 from Table 4.1) and the school had plans for more rooms to be built with desktop computers. A noteworthy aspect of the Ridges ICT infrastructure was their school network. Unlike the other schools in the study, Ridges had an effective network set up where teachers

could share ideas and resources and indeed, there was a significant sharing culture in the school (see Sect. 1.2.5).

The PDHPE faculty was the first to get an IWB at Hidcote, and this occurred in 2003. Some faculties put in requests for data projectors and other faculties put in requests for IWBs. The principal suggested that all these faculties get IWBs, which occurred. However, this still left four faculties without IWBs because they had not requested either data projectors or IWBs. The school executive are currently working on promoting the use of IWBs to these four faculties. They are doing this by supporting staff in those faculties to gain enabling skills, using the KISS principle. The AP felt that the head teacher of teaching and learning was able to show how effective and achievable usage of the IWB was for first time users. It was important that the technology was easy to operate so that reluctant users would be more amenable to their use. It was anticipated, at time of the case visit (late 2005) that the remaining faculties would each get an IWB in 2006.

Bayview was in the process of expanding their usage of IWBs when we visited them. The first two boards were obtained halfway through 2005. At the time of the first visit (term 2, 2006) we saw these two boards located in two classrooms. These boards were on trolleys that were semi-portable. They were in the classrooms of the social studies and computer teachers. Zach (the principal) uses the board(s) for presentations, consciousness-raising and he wants one available for interested staff to play with. As well, three rooms have been wired for use with IWBs, as general-purpose rooms. On the second visit, in term 3, 2006, another IWB was set up in a mini lecture theatre attached to the TLA (Teaching and Learning Area or library area), and a fourth one was in the lecture hall. Will noted that accessibility was critical in his use of IWBs. "Here it is easy because I have it all together on a trolley which stays in my room. Just plug one thing in and push one button. If I had to put it all together, IWB, computer, and book data projector etc. it would be much harder. Need it all ready to go and just push the button." The trolley and computer can be pushed from room to room.

At Sheridan, the IWBs are placed in the library and computer rooms but the principal commented that he felt that that these were the wrong places for them as they really required teacher commitment in order to be useful. Their end of year goal (2006) was to have one IWB in every classroom.

Finally, at Kirkland, there was one IWB, which had been obtained by the previous teacher/principal.

Of note, in this section, is the fact that at most of the schools, more IWBs were being purchased and that a number of schools were hoping to have each faculty or each classroom supplied with one by beginning of 2007. Also of note is the fact that in most schools, the advent of the IWB was fairly recent, and teachers had only just started using them in two of the schools we visited.

#### **5.2.4.2 Other resources**

The following were also mentioned as useful resources for IWB work.

- Networking of the whole school and five digital cameras in the school (Darcy)
- Use of Microsoft PhotoStory and digital video cameras (Ridges, AP)
- The use of WebQuests by the history faculty (Hidcote).
- An annual film festival, the first occurring in 2004 and the second in Dec 2005 (Hidcote).

Staff are learning how to add files to the intranet for the whole faculty to be able to access and use. (Hidcote)

Staff mentioned that a facilitating factor for their use of IWBs was the provision of appropriate resources. Hannah at Hidcote discussed the fact that the PDHPE faculty funded the purchase of their IWB and this allowed them to take the initiative in developing its use. She mentioned that “the new version of the [software] has re-inspired me” and also noted the continued financing by the faculty for ICT related products. Another member of the PDHPE faculty noted the value of having a dedicated room set up with the IWB.

Finally, at Sheridan, Mary talked about her use of resources for the IWB. “All visual teaching and learning resources e.g. work sheets [can be scanned], [as well as] cards for phonics and vocabulary, sometimes as a set up lesson on CD or file and sometimes as a standard board. I also incorporated scanner, printer, photocopier - this additional resource, the IWB, has assisted in the classroom.” (Mary, Sheridan)

A few comments were made about the lack of resources in some of the schools. Hannah mentioned that she would like more resources specifically related to the classroom use of IWBs (Hidcote). At Kirkland, Leah told us that when she went to IWB use, it emerged that it would be important to get other equipment up-to-date: “You (the researcher) asked the children earlier whether there were any technical difficulties -they always say yes to that – but now the technical difficulties are very limited. Occasionally they have to re-orient the board. Apart from that, there are few problems. Frustrating at the moment is that the IWB is not useable with [all] computers. You go to courses and you see things and they look great, then you try to do them at home and it doesn’t work.”

#### **5.2.4.3 Software and hardware limitations**

Some staff members noted the limitations of the IWB software e.g. the “typing in boxes” (Evie at Ridges) and “No problems with IWBs but did have problems with Thinkpads.” (Will, Bayview). Others noted that there are limited times when the IWB is in use: “I aim to have it operating most of the day”

There were occasional technical glitches — teachers had to use the computer keyboard when “some things did not link or the printer cartridge ran out when we want to print something” (Sheridan). However, staff at Sheridan believed that technical support would eliminate these problems. “I’d like to think we will get more technical support.”

#### **5.2.4.4 The Le@rning Federation learning objects**

The Le@rning Federation (TLF) learning objects were used with the IWBs and proved to be a useful resource with the IWB. This was particularly evident at Darcy where widespread use of learning objects was observed. Quentin had attended a TLF Professional Development Day and believed that these objects had “become a big part of what we do!” Rosemary had attended TLF PD days on learning objects and had also attended the session by an IWB producer. These PD days and the school’s policies have encouraged her to use learning technologies in her teaching. Similarly at Ridges, use of TLF learning objects was common.

#### **5.2.5 School culture**

The school culture in the case schools shared various characteristics, which appeared to encourage innovation in those schools. Common to all schools were the following: a principal who was interested in the use of IWBs, an expectation by the

executive that staff would participate in the use of this new technology, an expectation by students that staff would be technologically competent, and an effort by the executive to ensure that resources and technical support for use of the boards was available.

Interested and enthusiastic principals have already been discussed in an earlier part of this chapter. The other factors are discussed below:

#### **5.2.5.1 Expectations and support by executive and other staff members**

In the majority of schools in the study, school executive and teachers talked about the expectation that staff would all learn to use IWBs. A number of people talked about the way that those who were already using the boards would mentor others to get involved. Principals used this as a strategy to get all on board and teachers also talked about helping others. For example, the principal at Darcy explained his strategy for getting buy-in from the whole staff: “Some teachers are not computer literate – so they have to team up with more able computer literate teachers – I tend to target those teachers that are ICT literate and find the whole ICT focus non-threatening e.g. people who can cascade their ICT learning onto others, like Samantha. The school provides a mutually supportive environment, a network of colleagues mentoring one another ... it’s about making teachers like Cindy feel comfortable – I guess you could call it leading by example.”

Hidcote had another challenge to deal with, with respect to full staff participation: “The school has an established staff with experienced teachers. However, they need to be convinced that using ICT is better than their existing practices” (Principal). Although the school was previously not all that interested in the use of ICT, it currently strives to be technologically advanced so there is a “culture promoting the integration of technology across the school.” (Ingrid at Hidcote)

The AP at Bayview suggested that the culture at the school was influencing the participation rates in using ICT: “There was a little resistance but there is already an impetus from the culture of the school and that helps e.g. a few staff members might have moved on quietly”.

Sheridan staff also mentioned the mentoring aspect as a factor in getting all staff involved: The principal “allows these people [the power broking teachers] to explore and then initiate other people into the next stage” As well, the supportive nature of the staff for professional learning was mentioned: “Staff have been supportive — after initial hiccoughs, all are keen to use and share ideas. The number of staff [that] trained together encouraged and enhanced sharing of knowledge and ideas.” (Mary, Sheridan)

The importance of a collegial and supportive staff was highlighted by the comments made by Leah, the teacher/principal in the one-teacher school, Kirkland. She gets the “biggest buzz” from attending Principals’ conferences and regional meetings, because of the collegiality. Leah misses having colleagues in a small school situation. She would like this to happen more now that she has an IWB, as she misses having two or three people team teaching through the whiteboard. They would have been able to bounce ideas off each other and share ideas. This does not happen for Leah, unless she goes somewhere.

Support of staff by each other was seen as an important facilitating factor in the use of IWBs. For example, “Teachers have had a high level of support. Most teachers are really looking forward to using an IWB and there have been many requests to have one! Only a few staff members don’t want to use ICT.” (Principal,

Darcy). This comment was confirmed by Samantha, who thought the staff at Darcy, especially those using the IWBs, were very supportive of each other.

Finally, the executive at Ridges provided a distinctive and significant ‘culture of sharing’ in the school to support professional learning. As noted in Section 1.2.4, the intra-school network at Ridges supported the exchange of ideas and resources amongst staff. According to Astrid, the ICT Committee Chair, “the school takes a cooperative approach: We’re into sharing”. The school’s network set-up “encourages a frame of mind where you share resources”. In this way, Ridges was further developed than the other five case schools. The initial interest among the Ridges staff had expanded and there was “a second wave effect after seeing how it (IWB) was working. It’s been very much a ripple effect. I think because people saw how effective it was operating in Stage 3...it wasn’t just a play thing...it actually became a real learning tool” (Francine - Assistant Principal). This ‘second wave’ of users seemed to provide a critical mass for this more sophisticated level of sharing. For example, Catie at Ridges found her colleagues’ sharing of units via the school’s computer network to be helpful; she noted the sharing culture which helped ameliorate any perception of the “time consuming nature of planning IWB lessons” (Ridges). Evie also noted the value of the collegial support at Ridges while Donna noted the facilitatory effect of having all Kindergarten teachers working together and sharing lessons. This potential to share resources had not been realised at the other schools but was anticipated by leading staff such as Ingrid at Hidcote.

#### **5.2.5.2 Expectations of students**

Staff at three of the schools mentioned that the students were a facilitating factor in their use of IWBs. Their interest in using the latest technologies, as well as their expectations that their teachers would be technologically competent, seemed to drive teachers to use the boards.

The principal at Darcy noted, “Indeed, the children have put pressure on teachers to have one![IWB]” and one of the teachers at Ridges suggested that knowing the children loved the use of the board was a facilitating factor for her. At Hidcote, the principal told us,

The students learn quickly and there is pressure on staff to keep up. Teachers who have transferred from other schools make the comment that the students learn so quickly that they have to provide much more teaching and learning material than in other schools.

This comment was supported by the head teacher, Teaching and Learning, who said the students’ familiarity with technology was supportive in encouraging its use in classes.

#### **5.2.5.3 Supportive parent culture**

Most of the schools in the project acknowledged the presence of an interested and supportive parent body. Parent bodies were often responsible for the purchase of IWBs. Pam at Darcy told us that the parent body was “really supportive. For example, they were happy to pay for 10 more IWBs! P&C sees these boards as an integral part of teaching.” Samantha thought the parents really liked the IWBs initiative and so were interested and supportive (Darcy).

A similar view was held at Ridges as Catie indicated that they had a parent body that seemed to be supportive. However, although parents are involved in policy making, the “main teaching initiatives are shared between staff” (Ridges).

At Sheridan, the P&C had just raised \$5000 for whiteboards. One family had made a full donation for a board on leaving the school.

The other side of the coin was indicated by Leah at Kirkland, who told us that the parents want her in school as much as possible. She felt torn between demands of the Department and demands of parents/community. She added that she “can’t rely on input from the parents as they are in a low SES group – many unskilled shearers’ children, single parent families where parents’ level of education is poor.”

#### **5.2.5.4 Professional development on offer**

Professional development was important and this was often done by peers or in the case of Hidcote, the principal. As well, a number of the teachers noted that useful professional development was offered by the whiteboard manufacturers. Rosemary at Darcy told us how she “attended the session by an IWB vendor. These PD Days and the school’s policies have encouraged her to use learning technologies in her teaching.” A staff member at Ridges suggested that “PD gives you the motivation to go and have a play”.

Leah, the sole teacher at Kirkland, envied the opportunities that others had for PD. She noted that she “envied Principals who are non-teaching because they can just leave for the day and get the A.P to do their job – no need to prepare lessons for replacement teacher. Planning for replacement teachers can take up to two hours. There has to be a weekly lesson plan and this has to be communicated to any replacement staff.” However, she did attend a two-day training course offered by the regional staff.

For Will at Bayview, staff development days have been a major help. At the last staff development day (SDD) staff were offered a number of options, one of which was the option of learning about IWBs. Subsequently, Will was asked by Zach (principal) to participate in this project so he taught himself to use the IWB. He brought it up to his classroom and plugged it in and had a play. He liked the ideas at the SDD e.g. the sessions on how to capture sections from the Internet, e.g. maps, zooming. Val (software coordinator and technology teacher) ran the Staff Development Day. About 12 people attended. Will liked the novelty factor, it appeared to be fun (as he had been doing ‘chalk and talk’ for 19 years), and it was not only a novelty for him but for the students too, as they got to do something different, have a change. He found it pretty versatile. He also noted that a person from the IWB vendor came in and spent an hour doing a demonstration with Val and him, and they showed a full range of activities.

As well, Will talked about how he had learned about using IWBs from demonstrating their use to colleagues. Demonstrating it to help staff accelerated his own learning, as he had to show features and the potential of IWBs. His enthusiasm was important. He tells his staff that students love it and tries to overcome staff members’ natural fears. A couple of staff members are a little bit reticent, which Will puts down to the “fear factor”. He gets them to play, “do stuff with finger on board, start writing”. A different note was sounded at Sheridan where a teacher felt that more opportunity for professional development was needed.

In general, data from the cases agreed with the online survey responses (n=87), where teachers said they overwhelmingly relied on their colleagues (56%) as their main source of support for using interactive whiteboard (see Appendix 1.6, item 15). Like the case teachers, most of the teachers responding to the online survey said their learning about interactive whiteboards (33%) had been provided by the vendor (see Appendix 1.6, item 7) and many had their professional development provided by the school (24%) or were self taught (24%).

### 5.2.6 Time

We believe that time is an important affordance for the development of IWB lessons and skills in using the tool. Teachers needed time to learn and to prepare their lessons using the IWBs. The most common factor mentioned when asked what factors constrained use of IWBs was the lack of time. A sample of these responses follows:

- Lack of time to prepare lessons "it takes so long to prepare a 20 minute lesson" (Darcy)
- The time needed to teach students how to use the board. (Ridges, Kindergarten teacher).
- The time factor – preparing lessons was time consuming e.g. collecting resources (Catie at Ridges)
- Half the time I use the IWB as a data projector because the time it takes to put together a lesson using the IWB software is too long. It is a real struggle. Our faculty has an old version of the software and I believe the newer version is much better (Hidcote)
- Time to develop resources and this is linked to finances (Hannah, Hidcote)
- Time to plan lessons. Time to develop knowledge. Would like further knowledge to do more interesting things with the IWB rather than just basic things. (Ingrid, Hidcote)
- The biggest challenge is getting teachers to give time to the technology e.g. the IWB, learning how to use the IWB. (Principal, Bayview)
- TIME to learn and money. (Val, Bayview)
- TIME mainly (Leah, Kirkland). Leah blamed her own 'poor time management': "I must put time aside for seeking out sites. Also limiting that time so it doesn't 'blow out' to 3 hours. It can get confusing using the Internet." As well, she would like more specific websites she can use with an IWB: "overabundance of sites can be a problem. How do you choose from over 3000 sites? Gleaning international sites takes time – you still have to edit them to suit your own requirements. They have to be adjusted for individual classes, not just grades. Less writing, more visual resources, time [is needed] and not knowing what is available out there, what is good and what is not".
- Leah would like more time to: "philosophise and reflect. Often though, the day is quite long, the students have accidents or anger management issues which take up time which could otherwise be reserved for my e-learning research. More time is taken up with school policies and other management issues and communicating with parents".
- I need some more time to try out techniques and technology - Country/Rural living e.g. I live out of town — too close for satellite but no Broadband so I am limited to investigating, practising and using Internet to school time. (Mary, Sheridan)

### 5.2.7 Lack of confidence

A final factor constraining use of IWBs appeared to be a personal one: lack of confidence. Two teachers mentioned this as being significant. Will at Bayview talked about other staff members' lack of confidence: "... technophobia, a fear that it won't work in the classroom, won't work, will look like klutzes in front of students (e.g. today the cable was not connected) – people would worry about that. Not being confident with the whole technology thing is a problem, some barely know how to use

PowerPoint or Word, now they have to do this ... need to get them comfortable. Or give them prepared lessons to use: here's lessons, if there is a week's lessons, they might think there is something in the use of IWBs, they would try it. This staff is pretty willing to have a go." (Bayview)

Leah at Kirkland mentioned her own doubts and concerns: "The IWB was here when I arrived and the parents expected that I should be using it, but I wasn't sure how to do it – there were no lessons so I just had to try it". She likes to keep improving her skill and technology learning but parents and the students don't like it when she is away from the school "I feel I'm in a bind". She added that there were aspects she would like to try: "I want to use the web cam capability more. Be great to use it more in art classes"

Most other teachers did not mention a lack of confidence and in fact, Ingrid (Hidcote) mentioned having a confidence in using the IWB that stemmed from her competence and experience with computers.

### **5.2.8 Summary**

It can be noted that there are several common factors in the school culture that promoted and encouraged appropriate use of interactive whiteboards. These are: the presence of a supportive and enthusiastic principal who will resource initiatives if they are deemed to enhance learning, and a collegial atmosphere in which support and mentoring of one another is encouraged. Indeed, a 'culture of teacher sharing' of resources and ideas is instrumental in teachers' professional learning and use of school Intranets can facilitate this process. Key people in the school who have a special interest in the technology also tend to help promote its use. Finally time is an important factor: time for professional development, time for teachers to play and learn, and time for students to develop skills.

## **5.3 What pedagogical approaches are being used with this technology?**

Teachers tended to use the IWB predominantly for explicit instruction and presentation, although they did give students the opportunity to participate in whole-class activities by interacting with the board, writing on it, or responding to discussions. Some interactions with the board in small groups or pairs was also observed. However, most of the observed interactions were dominated by the teacher and we only saw a few instances approaching 'dialogic' exchanges, taking into account students' understanding, exploring their ideas and generating new meanings (Mortimer & Scott, 2003). Teachers viewed the IWB as a portal to bring in rich authentic contexts into their lessons and they also saw the technology as a significant organisational tool.

The major sources of the data interpreted in this section were lesson observations, interviews with teachers and students' views as ascertained from focus group interviews. Some data from the online surveys is also presented (see also Appendix 1).

### **5.3.1 Whole class interaction**

In general, observed lessons tended to be in whole class format and there were few examples of group work. Teachers saw the major use of IWBs as providing a form of *interaction* for whole class discussions, exercises and exposition work. However, these interactions were of an authoritative nature.

Students were adamant that they didn't feel 'left out' when someone else was using the IWB and thought their teacher was very fair in distributing the use of the IWBs in whole class situations (e.g. Samantha's year 4 students, Darcy). These students also felt that the teacher was more accessible when using IWBs. Compared to lessons in the computer room where the teacher was often at 'other end of room' and where it could "get too noisy if the program had sound ... [and each student was on an individual computer]" they appreciated the more flexible arrangement with the speakers on the IWBs (Samantha's students, Darcy). Others also reported feeling the teacher was more accessible when the IWB was used: "We like the teacher facing us with the IWB in close proximity. This is preferred as when a data projector is used, the teacher is remote from the material being displayed." (Geraldine's year 11 students, Hidcote)

The view that students prefer a whole class discussion setting arose frequently from both teachers and students. This is an interesting perspective given research in the last decade, which has critiqued this way of learning and promoted small group learning instead. Connectedness, relevance and ownership were features that teachers mentioned when discussing the provision of whole class discussion. As well, control was mentioned by a Year 5 student: "We do it ourselves; we get turns, for example, reading, writing on the web. We don't feel left out – we can still tell them what to do."

As well as using the IWB for whole class lessons, teachers used the IWBs prior to giving group work to the students. Teachers did their scaffolding and preparation for small group work, through demonstrating procedures on the IWB or getting students to model the work on the IWB. Students enjoyed being able to undertake whole class activities in preparation for smaller group/individual tasks. Students also appeared to be supportive of others who were using the IWB. However, these whole class interactions were very much controlled by the teacher, often in a traditional *authoritative* interaction (Kershner & Warwick, 2006). The teacher would lead students through a series of questions and answers with a particular outcome in mind. We did see a few instances of more sophisticated interactions, giving more status to students' views, focusing on feedback, elaboration and support, for example, Geraldine's Year 11 Geography lesson at Hidcote (see Example Lesson 5 from Chapter 4).

One of the teachers commented on how the whole class access provided the QTF element of connectedness. "...it's real, it's relevant. Bringing a narrative into the lesson – you're talking about it, questioning, it's real not lecturing." She stated that as the students were very familiar with television "having a big screen up there ... they're in their element ... it's a big way for them to learn." (Evie, Ridges) This analogy to students' experiences of watching television and films is an interesting one. Indeed, the researchers' impression when observing many of the lessons was that the experience was similar to that of watching a video but more interactive and scaffolded.

Leah at Kirkland mentioned how the whole class access inspired students to interact with each other and spur each other on: "the children liked it when they did their assessment for the Olympic Games. Their recall was there to a certain extent – one student answered a question and this sparked the other's memory. They inspired each other to come forward. It will just give me that focus again to look at the children" (Kirkland).

The researchers observed that numerous games were played, which used the IWB. The games were played as whole class activities, and this would probably not have been possible without the IWBs. (Observations: Quentin's class, Darcy)

### **5.3.2 Group work**

As noted above, small group work with the IWB was infrequently used. This is unsurprising as the nature of the technology promoted whole class work, teachers were being observed and most were new users of the technology. A few examples of group work that the researchers observed follow:

Quentin (Year 2 teacher, Darcy) used the IWBs for reading groups. For example, students use a phonics and grammar program. Quentin works through these programs together with the students, in four smaller groups. So Quentin might work with one group at the IWB while other groups work independently.

Mary at Sheridan also talked about having group work integrated with the use of the IWB. "I aim to have one group or one individual (minimum) on the board at any time.

I have had to re-organise the room so that the students at the IWB do not distract those involved in other individual programs or who are working with an aide or independently."

Finally, Leah at Kirkland (who only has a small multi-age group as her class) said, "I can use the IWB to engage the older children by grouping them in different ways, they interact, take turns."

### **5.3.3 Use as organisational tool**

The project confirmed the findings of other projects on IWBs that indicated that a major affordance of this technology was its capacity for storage of pre-planned lessons and resources. Teachers also did more careful lesson preparation and also became more aware of relevant websites and resources that could be used in their lessons. Hence its strength as an organisational tool was noted.

Evie at Ridges noted that students could manipulate objects on the IWB and she could bring things into the classroom easily. "...before you'd be chasing large colour pictures from libraries, download at home and print out – cumbersome. Now it's there easily on the big screen." The Assistant Principal at Ridges also noted this feature of organisational ease: "I can keep everything there as a record of the day's work. ... In preparing lessons I can email files from home to work, no board work. Hence, less interruption in transition from lesson to lesson. It's a really good organisational tool and it's an excellent delivery tool." (AP, Ridges)

Ingrid at Hidcote also felt that IWBs assisted organisation and engagement. "It is easy for me to take material from the workbooks that are provided for the PDHPE staff and modify it to make it more interesting and suitable for use with the IWB. I was able to import PowerPoint slides and insert images and use the notes from the workbook that I type into the IWB software. The lesson is more interesting for students than just looking in a text book."

Another appealing aspect is the ease of transference of material. "If I have a PowerPoint presentation, I can't change it on the spot, I have to go home and change it. But with an IWB, I can change it in class, or I can use a mind map and get students to fill it in." (A.P. at Bayview). The Assistant Principal went on to note how she had created a mind map with her class during class time, they had filled it in, and then she sent it out to all of them via email. The interaction with the board was helpful organisationally.

Leah (Kirkland) uses the links on the IWB so that she can plan a whole page and have the links ready in the page. If everything is written down and she has bookmarked all pages in one folder, this speeds up delivery: “you can present 10 pages at the same time”. This method of preparation contrasts with her previous paper approach and highlights the efficiency of usage of the IWB. As well, she likes being able to print out anything she has written, to store and record. For example, if she keeps a student teacher’s 36 pages of lesson notes, she can adapt this into a theme of her own. She enjoys the IWB as a tool with good storage capacity and backup options, and likes using it as opposed to having a computer on her classroom desk “which she doesn’t use much”. She added that she “like[d] being able to print and store what I have done with the children. I can store their work too, the visual memory that this tool enables is impressive – I can back it up and burn to a disc.”

This view was repeated by a teacher at Sheridan: “The fact that you can store what has been done and re-visit is a huge advantage.”

Will (Bayview) mentioned that although it was time consuming to prepare the lesson, the fact that they could be saved was important. He could “pass on the memory stick to others. They can take what they want, modify it or not. You can’t do that with chalkboard”. Will has a number of lessons and images, which he keeps in a faculty allocation of space on the school hard drive. So he has a library of material that can be used with the IWB.

### **5.3.4 Explicit instruction**

Teachers tended to use the IWB largely for explicit instruction and this was in keeping with the whole class nature of the pedagogy associated with this technology. However, as noted above, they also gave students the opportunity to interact with the board, by writing on it, or responding to discussion centred on the material shown on the board.

Interactive whiteboards are extremely suitable for explicit instruction. The size and visual capacity of the boards encouraged clear explications of subject matter and the ability to link to material supported this. Preparation of material for and on the boards also encouraged thought about the learning outcomes required. The principal at Darcy noted that teachers were becoming more explicit in their teaching. He mentioned that “instructional values of deep learning are very important” (Principal, Darcy).

Teachers also mentioned their use of IWBs as being an improved version of pedagogy using a chalkboard or overhead projector. For example, IWBs had become an integral part of Catie’s lessons. Others noted, “What we would do on a chalkboard, we are now able to do a thousand times better!” (Pam, Darcy) and “I am not using the IWB’s full functionality – it’s a bit of a glorified OHP [overhead projector] at present” (Natalie, Sheridan).

Quentin (Darcy) mainly used the IWB as a demonstration tool. For example, he would scan pages out of textbooks to use in class discussions and exposition work. He said the students liked this modelling on the IWB. So, the class would work together on textbook questions that he had displayed on the IWB and Quentin would work through solutions with them on the non-interactive board.

In most of our observations, the teacher directed the whole session. There were frequent questions directed at the students, for example, “What does this word mean? Can someone help him / her?” Lessons would follow a schedule of explicit instruction, followed by teacher questioning and then sometimes go into group work to consolidate the concept being taught.

Natalie at Sheridan noted the value of modelling learning using the IWB. “I model learning I want them to understand. For example, note-taking exercises have been very successful – the students come up to the board and write – they know it’s okay to make mistakes and I have seen previously reluctant students take more risks with their learning, especially in subjects like HSIE”.

When asked how they saw their pedagogical approach with the IWBs, teachers tended to say that they used a mix of explicit instruction and facilitation.

### **5.3.5 Provision of rich, authentic contexts**

As noted in a previous paper by the authors (Kearney & Schuck, 2006) the term authentic learning has a variety of meanings. There is consensus that authentic tasks are those that provide real world relevance and mirror the common practices of the society. Barab, Squire and Dueber (2000) suggest that the authenticity comes from the links that learners are able to make between the practice and the value of the practice. At first glance, the lessons using the IWBs would seem to be anything but authentic, reflecting as they do, the teacher-directed pedagogy that generally occurs. However, teachers did talk about rich, authentic contexts and practices that are afforded by use of this technology.

For example, a teacher at Darcy mentioned how she can easily bring rich contexts into her lesson: “They allow you to do things that you’ve never been able to do before.” For example, she did a lesson on negative numbers and the students asked her “how is this relevant?” She responded “I was able to pull up a weather program ... the whole class could see it. It was large, it was interactive, they were able to see the negative numbers ...” (Pam, Darcy).

Two teachers from the online survey chose to comment on rich contexts. One teacher commented how easy it was to bring current topics into the classroom: “I think the IWB has changed the way I teach and is much more engaging for the students. I can easily bring in up to date information into the classroom especially via the internet. The recent earthquake near Katoomba was an example in Year 9 Science”. Another teacher said: “Hyperlinking to web sites really helps students connect with the concepts I teach. Google Earth on the board is brilliant and students are interested in geography again.”

Another teacher at Darcy, Rosemary, informed us of the access to authentic material that was encouraged by IWB use. She told us that she was more inclined now to look for interesting resources (e.g. through web sites and the use of the scanner etc.). She is now more aware of web-based resources – she will see something on the web and think, ‘I can use that (easily!) and download it’.

This facility to link to “authentic” resources was noted by other teachers as well. The ability to connect so ‘easily’ to the real world was noted as linking to the Quality Teaching Framework in terms of connectedness and significance to students. At Bayview, Val noted how she liked the way the IWB “allows you to connect to the world and be creative: You can actually take whole countries and move them! You can re-arrange the world! You can do what you want. The limits are your imagination (not just visually but musically!)” However, the researchers noted that use of communication facilities to connect to people outside the classroom was rare.

Leah, at Kirkland, noted that the students were “doing stuff for the Winter Olympics. They liked seeing the Internet on the big screen, also the Commonwealth Games.” She also noted the authenticity of a lesson “when the two Canadian teachers that were here showed us where they lived, especially [with] the story of maple syrup.”

In general, then, the authentic nature of tasks and contexts was realised in a minimal way through links to current websites and illustrations of topics. The links to so-called “authentic” content was provided by use of the boards, rather than the development of complex, open-ended authentic tasks requiring collaborative problem-solving over a longer time frame. We will further discuss this theme in Chapter 6.

### **5.3.6 Teacher roles**

This technology did not seem to encourage teachers to act as facilitators as much as it seemed to promote more active roles for them. Three types of teacher role were noted as occurring frequently in IWB lessons. These were questioning, managing student presentations and the facilitation of student learning (infrequently observed but discussed by teachers). As well, an important teacher role was the preparation of resources and lessons on the IWB (see Section 1.3.3).

#### **5.3.6.1 Questioning**

As part of the whole class teaching that was most common with the IWB, teachers used questioning to develop concepts and encourage interaction. These questions tended to initiate a traditional I-R-E type of interaction (Mehan, 1979), that is, teacher would initiate (I) the question, students would respond (R) and then the teacher would evaluate the response (E). Often teachers would note the responses on the IWB. However, student questioning, either of the teacher or of each other, was seldom noted as occurring in the lessons we observed (see also Section 5.3.1). Most of the questions asked by the teachers were fairly closed questions, although they did help to develop the concept under discussion.

#### **5.3.6.2 Managing student presentations**

We observed one teacher giving a lesson in which the students made presentations using the IWB. As well, the principals of several schools noted that students would make presentations for school functions. At Bayview, the Year 12 students developed a presentation on an aspect of Internet usage and then presented it to their classmates and teacher, using an IWB. The students were very competent at using the board. One student would read from the monitor of the computer so he could face the class (he had the monitor turned to face him), and another student would highlight items on the board or circle them to guide our attention to them. They also used the IWB to show movement in animations, and movies and well as write on the boards where appropriate. The students showed a use of the boards that could not have been as easily achieved using other technologies.

#### **5.3.6.3 Facilitating independent learning**

Independent learning was not observed as a feature of the IWB lessons in this study. However, teachers noted that the ability of the IWB to promote independent learning was a feature they liked. This statement was sometimes at variance with the lessons we observed, which tended to be teacher-directed, whole class lessons, with little independent work that incorporated IWB use.

Teachers made many positive comments about independent learning with the IWB. Rosemary at Darcy emphasised that she liked the students to work independently. For example, she told us that she “likes the students to use the IWBs independently and rarely leads them through the IWB ... they take responsibility. I am a facilitator”. She is comfortable with the students teaching her too. “And the students as well are teaching me! They come up with lots of good ideas. They are

taking responsibility for it. ...The students are taking ownership and initiative. For example, they'll ask me: 'can we do this Miss?'" She added that, "There are more suggestions coming from students...and comments from students since the IWBs came into the room." This may have occurred in other lessons, but the lessons we observed had Rosemary in the 'driver's seat' during the whole class session, sitting at the computer as she mediated the session.

One of the teachers at Hidcote stated that she preferred lessons that are less teacher-directed. "I like students to be involved" (Ingrid, Hidcote). The principal at Bayview believed that in his school, "Teachers work on engaging with students. They work on not shouting but building relationships." And Val at Bayview explained what her rationale was for the presentations we observed her students giving. "I like to give the students responsibility e.g. by making presentations".

In general, although teachers highlighted the value of IWBs for encouraging independent learning, the researchers did not see much evidence of this in the lessons observed.

### **5.3.7 Assessment and evaluation**

Given that in most of the classes, the IWBs were a very recent phenomenon, few teachers had the opportunity to develop assessment procedures that used the IWBs. A few of the teachers noted that they were looking for ways to incorporate assessment with the IWB.

Teachers were also eager to evaluate this technology, but such discussions were at early stages. Hannah at Hidcote noted that she used observation to assess the effectiveness of the IWB. Presumably, she evaluated the amount of student engagement and participation occurring in IWB lessons.

Leah at Kirkland told us that she was looking for ways "to assess the students with the IWB. The students liked it when they did their assessment for the Olympic Games. Their recall was there to a certain extent – on student answered a question and this sparked the other's memory. They inspired each other to come forward. It will just give me that focus again to look at the students."

Another teacher (at Sheridan) noted that assessment of spelling is easier and more immediate when the IWB is used. Val (Bayview) assessed the presentations given by her students, not only for the content presented but also for the mode of presentation.

### **5.3.8 Potential of IWBs**

Once again, it must be stressed that for most of the schools that we visited the interactive whiteboards were recent arrivals, in one case arriving a mere three weeks before our case visit. In one case, the school had owned IWBs for a number of years and the practice at that school was noticeably more sophisticated.

In general, there was little use of the full potential of the IWBs. We believe the limited use was probably due to the relative newness of the tool, the lack of time for staff to experiment and use the IWBs to their full advantage, and possibly because of the nature of the technology.

Some innovative practices observed were:

- Using an interactive board alongside a traditional whiteboard to contrast two ways of completing an algorithm
- Use of interactive tools to highlight key words on the IWB
- The movement from one sequence to another on the IWB

- The manipulation of a template for a poem so that just the outline remained, and the facility for students to write their own poems in the outline provided
- The use to demonstrate a database and its workings to a class
- The pull down of screens and scrolling to fit the didactic nature of one teacher's approaches
- Building up of concepts and having students participate and then enthuse each other by providing stepping stones to their ideas
- Grouping students in different ways and having them interact on the IWB with ideas at different levels.

In Will's words, "The fundamentals won't change. Efficiency, speed, ability to keep what has been done, fun aspect, are aspects of use of the IWB that are different. There is innovation, not the same old, same old, same thing in a different style. We have access to a much broader range of stuff e.g. the atlas might be out of date but we can get a map from the Internet that is up to date. Plus we can look at six or seven different projections of the world."

To conclude this section, we raise the question about how teachers can extend their pedagogical repertoire to best get the potential from their IWB use and how they can stimulate higher-order thinking from their students. These important issues are discussed further in Chapter 6.

### 5.3.9 Summary

Observed lessons tended to be in a whole class format and teachers saw the major use of IWBs as providing a form of *interaction* for whole class discussions, exercises and explicit instructions. Hence, most lessons we saw were teacher-directed with little work that incorporated student-centric IWB use. Teachers tended to use the IWB largely for explicit instruction and this was in keeping with the whole class nature of the pedagogy associated with traditional blackboard use. This was in general agreement with item 12 from the online survey (n=87), where 48% of these teachers said they predominantly use a 'modelled or guided arrangement' with their students, while a further 22% said the main way they used the IWB was for class discussions (see Appendix 1.6).

However, the case study teachers also gave students the opportunity to participate in these presentations and interact with the IWB, by writing on it, or responding to discussions. The limited pedagogical repertoire in lessons we observed is possibly due to the relatively recent introduction of the tool into the cases classrooms. This suggests a professional learning focus that targets the potential of the IWB to expand and embrace the pedagogical potential of the IWB for a range of models of interaction. The project confirmed the findings of other projects on IWBs (BECTA, 2003; Smith, et al. 2005) that indicate its major strength as an organisational tool.

## 5.4 Conclusion

In this chapter we have presented the findings regarding perceptions about the value of IWBs, the school context and the pedagogical approaches most commonly used in the cases. Major findings include the following:

- The school executives perceived that there was great value in using the technology to act as a catalyst for teacher learning and integration of ICT into the curriculum.

- The above findings translated into executive support for use of the IWBs.
- There was a sharing of ideas amongst staff members that was facilitated by the use of the IWBs. School Intranets can further support this culture of sharing.
- There was a clear perception by teachers that the use of the interactive whiteboards encouraged ownership and interactivity of students.
- Lessons were able to go at a faster pace due to the technology.
- Many teachers noted the push by the students to use this technology.
- A teacher-centred whole class method of teaching was most prevalent. Teachers generally initiated authoritative communicative approaches in these whole class interactions with students.
- An enthusiasm shown by teachers for the use of the technology highlighted the organisational aspects that were provided by the boards.

However, higher-order thinking and clear learning outcomes were not highlighted in all lessons and it was not clear how these relate to IWB use.

## 6. Discussion and conclusions

### 6.1 Introduction

In one sense, the IWB is an improved ‘teaching technology’: a reincarnation of one of the oldest educational technologies (the blackboard). Hence, it is seen initially as essentially a teacher presentation tool, and underpinned by associated ‘traditional’ pedagogies. Alternatively, it can represent a gateway for learners to ‘reclaim the classroom’; a ‘window to the world’ (Val, Bayview) that learners can control through the inviting interface of a tactile, visually appealing surface or the mobile, accessible stylus. At the very least, it represents a new way for students to learn, using older approaches. At best, depending on how it is used and the nature of the learning task, it could enhance authentic learning in K-12 classrooms, and encourage a ‘disruptive pedagogy’, giving students autonomy in their influence over the direction of lessons and giving them a voice in whole-class interactions. This chapter expands on some of these themes. It also highlights the major findings in each of the three categories discussed in Chapter 5, critiques some of the statements that were made about the use of IWBs, and indicates the dominant pedagogies observed in the study.

### 6.2 Notes on methodology

This study investigated pedagogy, attitudes, and school contexts in six schools in which interactive whiteboards are being used. The research questions that guided this study are the following:

- What do teachers and students see as the value of using interactive whiteboards in lesson designs and what beliefs do they hold about this technology and its relationship to learning and teaching?
- What is the role of the school in promoting use of the technology? What other contextual factors constrain or enhance the use of this technology in teaching and learning?
- What learning outcomes are supported by the use of interactive whiteboards in various Key Learning Areas? What learning tasks are associated with these outcomes?
- What pedagogical approaches are being used with this technology?

The study comprised a case study at multiple sites, four of them primary schools and two high schools, all in NSW. The schools were all DET schools and there were three in the metropolitan Sydney region, one in an urban area out of Sydney and two in a rural area. The study was a qualitative one, investigating perceptions and usage through interviews, focus groups, observations and document analysis. An online survey of approximately 90 teachers supplemented the cases.

These findings were informed by a variety of data sources in a range of K-12 Australian contexts. Data incorporated principals’, executive staff’s, teachers’ and students’ perceptions (mainly through interview and focus group data), as well as classroom observations and school documents.

The two UTS researchers analysed the data and developed themes from their analysis. They found three major categories of findings and grouped findings into these themes and appropriate sub-themes, through independent researcher analysis and subsequent intra-researcher checking of categories. These three themes considered teacher and student beliefs about the value of IWBs and their relationship

to learning and teaching; the role of the school in promoting use of this technology; and pedagogical approaches used with this technology in classrooms.

It must be stressed that the study was a series of snapshots of current practice with IWBs. These 'snapshots' were taken in a range of NSW primary and secondary schools that were at different places on the continuum in terms of the newness of the technology to the school. Case study schools had possessed IWBs for periods of time ranging from two weeks to four years, and, in many cases, were still finding out the repertoire of activities that could be done with IWBs, as well as discovering the variety of features possessed by IWBs. This situation is in contrast to that discussed in the UK literature, where IWBs have been in classrooms for a longer period of time.

An important feature of the methodology used in this study is its underpinning by socio-cultural theory which emphasizes the importance of the context, the nature of human interactions and the reciprocal relationships formed between tools and their users.

### **6.3 Significance of the study**

The study is significant in a number of ways. Firstly, although contemporary research contains many claims about the value of educational technology, little of this research critically analyses the ways in which such technologies interact with the complex social environment of the classroom as done in this study. Secondly, although studies have been conducted on the use of IWBs in the UK, the use of this technology is just beginning in Australia and this is one of the first studies in NSW that goes beyond practice in just one school. Finally, this study considers the use of IWBs from a variety of perspectives. It focuses on the value of using IWBs as seen by different stakeholders, the pedagogical approaches used and the learning outcomes and school contexts for the use. Most of the other studies have concerned only one aspect of usage rather than looking at K-12 classrooms in all their complexity. As well, links to the Quality Teaching Framework (QTF) make the study of particular relevance in NSW.

The findings from this study indicate that the use of interactive whiteboards is viewed positively by system administrators, school executives, teachers and many students. Teachers particularly liked the organisational capacity of the boards, and the visual impact. Students commented on the way use of such boards saved paper, and the match of such technology use with their use of technology out of school. Systems and school executives were instrumental in promoting use of the IWBs and support from the commercial suppliers was noted as extremely useful. Learning outcomes observed were not specifically related to IWB usage, although most teachers appreciated the way it could be used to achieve QTF elements of *connectedness* and *engagement*.

### **6.4 Teacher and student beliefs about the value of IWBs**

The major benefit of IWB use noted by school executives was its facilitation of reflective practice by teachers. Some mentioned the Quality Teaching Framework as underpinning their teaching with IWBs and others suggested that it was a good way to get teachers to think about the integration of ICT into their teaching. Teachers and school executives all commented on the ease of use and noted that using the IWBs had encouraged discovery and learning of new skills. A major finding was that both

school executives and teachers viewed the IWB as a catalyst for teacher learning about technology and for teacher reflection about practice.

Teachers also commented on the interactive nature of the IWBs although this was not a characteristic that was obvious to the researchers when they observed lessons. A major benefit of the boards was their immediacy and convenience. Teachers appreciated the flexible nature of the tool and in particular, the ability to bring a variety of resources into the classroom and to efficiently access such resources. They also appreciated the way a lesson could be reviewed later in the week or term, because the material had been saved and stored on the IWB.

Finally, both teachers and students commented on the visual aspect of the IWB. The teachers liked the enhanced presentation skills they were able to implement and the students felt the large visual display, with its colour and images, helped them to understand more.

Both teachers and students liked using the boards because they were in keeping with the students' digital culture. In some cases, teachers told us that the students were driving the change to IWBs, and many noted that, as teachers, they want to use the technology in the classroom because it was consistent with the role of ICT in everyday life. They wanted students to become accustomed to a range of technologies.

### **6.5 Role of the school in promoting use of this learning technology**

An important finding regarding the role of the school was the enthusiasm of the principal. This enthusiasm was a key driver for IWB use. Principals set aside money for IWB purchase, and encouraged staff to start using them. They ensured that professional development was offered to staff either internally or through external sources, and strongly encouraged their staff to get involved in use of the IWBs. Another facilitating factor was the interest of the students in this technology. Teachers commented that they used them because the students encouraged them to do so and seemed motivated by their use.

### **6.6 Pedagogical approaches**

The main way that lessons using the IWB were conducted in the cases was through whole-class interaction. This mode of teaching is unsurprising given the nature of this 'whole-class' technology: one board in the front of the classroom and an accompanying stylus was considered by the teachers as best used as a resource for teaching the whole class.

The study identified over 40 different uses of IWBs in lessons (see chapter 4). Generally, we saw very little didactic lecturing as teachers attempted to use the IWB to establish purposeful discourse between themselves and their students (Alexander, 2006). However, the nature of this dialogue was often authoritative, and a traditional *Initiate – Respond – Evaluate* (IRE) interaction (Mehan, 1979) was most commonly used. The teacher would initiate a query or activity, the students would respond and the teacher would then evaluate the response. We saw few examples approaching a 'dialogic' process where teachers took more account of learners' understanding, focusing on probing students' views, inviting feedback and elaborations, and providing support for the 'meaning making' process (Mortimer & Scott, 2003). One

example of such dialogic interaction was observed in Geraldine's lesson with year 11 (see section 4.2.5)

Interestingly, both teachers and students suggested that students preferred working as a whole class, rather than in groups. We also speculate that the enthusiastic uptake of this technology was so high in case schools because it offered a way of teaching that was familiar to teachers and which matched their preferred whole-class pedagogical approaches.

When group work was observed, it was generally after a whole-class modeling or demonstration had occurred and the students then consolidated their understandings in their groups. However, most of the time, the activity at this stage was not collaborative but tended to be individual work on exercises based on the initial activity at the board.

A major affordance of the technology was the way it supported pre-planned lessons. Teachers noted its strength in this regard and commented on how easy it was to collect a variety of resources, plan a whole lesson and cater for unexpected questions by having additional resources stored but hidden from view until required. The value of being able to keep a record of lessons was noted in an earlier section.

### **6.7 IWBs and authentic learning**

There is general agreement that authentic tasks provide real world relevance and personal meaning to learners, although issues of what constitutes authenticity and how to design authentic learning tasks are still emerging (Radinsky, Bouillion, Lento & Gomez, 2001). In this sub-section, we draw on data from the study to explore ways that IWBs might facilitate authentic learning processes in K-12 classrooms.

The authentic nature of many tasks in the study was mostly realised through links to current, 'worldly' websites and illustrations of topics. Communicative, connected and multimodal features of the IWB were not fully exploited to enhance authentic learning. There was one instance where a teacher described use of the IWB as a vehicle for the class to communicate with 'real people' outside the classroom: Val (Bayview) told us how she did a video-conference using the IWB (see use 30 in Table 4.1). Her class used the IWB to communicate with another class in Canada using Skype and Google Chat. The IWB provides a unique opportunity for whole classes or small groups to communicate in this way (e.g. via chat, video-conference) with outside experts, relatives, peers etc from around the world, potentially enhancing both *task and process* levels of authenticity. (NB. *Process levels* of authenticity refers to how learner practices are similar to those practices carried out outside of school (CTGV, 1990)).

Indeed, despite their rationales for using the IWB, we only observed a few examples of teachers taking full advantage of the 'connectedness' of the IWB to embed other 'real-world' processes into their tasks. Evie (Ridges) was one such teacher. She described a HSIE /Maths lesson she had conducted as part of a unit on shopping with her Year 4 class (see lesson 18 from Table 4.1). The specific topic was *Who will buy?* She set the context of buying flowers for a wedding and used the Internet to go to the Sydney flower market web site and to online shopping sites. She also purchased an item on eBay and commented that this was a highlight for the students and following this, students suggested designing their own online shopping centre and this idea formed the basis of a future IWB activity. Similarly, Pam (Darcy) described a HSIE lesson with her Year 5 students. They organised a 'virtual holiday' overseas, choosing specific stopovers on the way to their destination (see lesson 2

from Table 4.1). They accessed the Qantas website for information on destinations, time taken, and other websites for currency conversion. Pam's students later recalled this activity with fondness. Finally, as discussed in section 5.1.7 and 5.3.5, teachers were conscious of the opportunity to use rich media (video clips, photos, sounds etc.) to bring real, rich contexts into their classroom-based tasks. However, the visual and especially the auditory affordances of the IWB were generally not being fully exploited for this purpose, perhaps due to the time-consuming nature of finding and sourcing such media or due to the relative recency of the technology and teachers' lack of familiarity with the potential of the technology.

In general, open-ended, complex tasks requiring problem-solving and the construction of valuable products using real-world skills (Reeves, Herrington & Oliver, 2002) were not evident in this study. Many tasks were highly structured, involved explicit instruction from the teacher and eventually led to fairly inert individual tasks spanning a relatively short time frame. Perhaps this was one reason contributing to the relatively few instances of small-group use of the IWB.

Also, although we did report on increased levels of student ownership (of lesson procedures), we saw little evidence of students 'owning' content on the IWB, for example, students presenting 'self-made' products to their peers (also see Kearney and Schuck (2006), for associated motivational benefits of using 'peers as the target audience'). We believe that as teachers become more accustomed to IWB use, such uses will become more common. The IWB has obvious potential for the promotion of authentic learning in classrooms, although ultimately authenticity "lies in the learner-perceived relations between the practices they are carrying out and the use value of these practices" (Barab, Squire & Dueber, 2000, p. 38).

### **6.8 Disrupting pedagogies or replicating old practices?**

Our study and recent research evidence suggests that IWBs can have positive effects on teaching and learning (BECTA, 2003). Kennewell, (2006) makes the point that despite the huge uptake of this technology, "To date, the top-down policy driven approach to pedagogical change, represented by the National Strategies in England, seems to have stalled at the stage of surface interactivity which is reflected in replicatory use of IWBs" (p. 7). Kennewell concludes by suggesting that there is a potential for IWBs to be more than a tool to support outmoded pedagogies. We take up this question in this section, as we consider the potential for IWBs to disrupt traditional pedagogies.

Hedberg (2006) suggests three categories of use of ICT in teaching and learning, based on Jonassen's (1996) emphasis on 'cognitive tools': presentational, representational and generative tools. Presentational tools are those that allow users to present content, for example, use of PowerPoint. Representational tools are those that can show relationships and Hedberg suggests that students writing and filming a script and then editing it would fall into this category. Finally, generative use would "enable the learner to construct their understanding of phenomena" (p. 175). Data analysis from this project suggests that interactive whiteboard use mainly fitted in the first category: material placed on the whiteboard was generally collected and displayed by teachers for presentational reasons. Student-generated material on the interactive whiteboard was not common in our research cases and where we did see such lessons, the students were also using the boards as presentational devices to a large extent, and to a lesser extent for representation. The dearth of examples of student-generated use of IWBs may well be because of the relative newness of this technology in Australian

schools; teachers need to become completely fluent (National Research Council, Committee on Information Technology Literacy, 1999) with the new technology and understand what they can and cannot do with this tool before they start investigating its use in new and innovative ways.

The teachers were central in our study. Observed pedagogy focused on the teacher's ability to present relevant and current issues to students through carefully prepared lessons which took advantage of the interactive whiteboards to offer a large variety of resources, attractively presented and dynamically arranged. Nevertheless, the interactive whiteboard was heralded by almost all teachers as providing interactivity for students. The major form of interactivity we saw was the tactile benefit for young learners who were able to have input to the material by using their fingers to circle items, rearrange them, write notes on the board and scroll through to find other resources that had been placed on the screens by the teacher before the lessons. It appeared to the researchers that the main observed benefit of the boards was not the ability to provide interactivity, but the ability to prepare, organise and store lessons, which led to highly structured, well sequenced lessons with access to useful resources.

Like similar studies (e.g. Kent, 2004), we found the use of interactive whiteboards for teaching and learning also led to the initiation of more teachers into the world of ICT. By agreeing to use a technology that, at first glance, does not appear very different from the traditional and familiar blackboard, teachers embark on a journey which leads them to Internet communications, resources on the Web such as learning objects, and use of electronic tools such as PowerPoint and presentation software that comes with the IWB. Therefore, the interactive whiteboard acts as a valuable conduit for teachers of varying levels of ICT proficiency to ICT resources that have the potential to enhance teaching.

The question that arises from this study is whether the teacher-centred pedagogies arose because of the nature of the IWB or whether the pedagogies dictated the choice of technology. Certainly, attitudes towards use of interactive whiteboards seemed very positive and despite the greater expense of the IWB technology compared to many other technologies, it was apparent that usage would be widespread. We speculate on whether this enthusiasm is because initial use of interactive whiteboards can replicate traditional teaching methods, enabling teachers to maintain control of the learning. If this is the case we suggest that the technology is not a disruptive one (Hedberg, 2006), that is one which supports pedagogies that will replace dominant and traditional pedagogies, but that it might become one in time.

## **6.9 Future directions**

There are a number of areas in which future research would be fruitful. The richness of data found in this relatively small-scale study of six schools in which interactive whiteboards were being used, suggests other aspects of research on IWB use would be worthwhile. These include the following areas.

i) *How can changes in pedagogies using the IWB be supported so that pedagogies interweave traditional didactic ones with disruptive, emancipative ones that improve learning?* Pedagogies surrounding students' use of interactive whiteboards seem to reflect traditional didactic pedagogies at present. Investigation of how use of interactive whiteboards can contribute to the formation of new pedagogies is vital if we are to use them to their fullest potential.

ii) *How can the IWB be used to create a more 'dialogic classroom' (Kershner*

& Warwick, 2006)? There is potential for student-directed discussions and interactions using the IWB as a tool to present, exchange and develop their ideas with peers, teachers and other ‘experts’ both within and outside the class and school community. What types of software, what specific tasks and what teaching roles facilitate this potential to give learners more status in class discussions and make students’ ideas and artefacts a central focus of class discussions.

iii) The IWB is yet another educational technology in the 21<sup>st</sup> century teacher’s ever-expanding repertoire of ‘teaching tools’. It raises confronting pedagogical questions for teachers, including when, how and to what extent to adopt more directed or student-centric teaching approaches (Chazan & Ball, 1999; Schwartz & Bransford, 1998). In the reality of the classroom, where time constraints, class management, assessment and other issues affect everyday decision-making, teachers must frequently make these difficult, challenging choices. *Perhaps the IWB makes this choice more transparent for teachers? Perhaps the IWB highlights this challenge more than any other educational technology? Also, what types of software might help teachers make these decisions?* These questions warrant further investigation.

v) *How can IWBs be used for small groupwork? What is the role of the IWB in computer-supported collaborative learning?* Most research has focused on whole class settings for IWB use. It is important to investigate how this technology can be used to encourage different types of peer learning within and outside of the classroom?

vi) *How can knowledge about interactive whiteboard use enhance teacher education?* Given that student teachers will be teaching their future students through a range of increasingly user-friendly technologies, such IWBs, having an understanding of how use of such boards can enhance learning across the school curriculum is essential. Research considering the implications for student teachers, and the ways in which they can be best prepared to teach in a technology rich world would be of benefit.

vii) *How does the presence of the IWB change teacher attitudes?* A point of conjecture in our study was that the mere presence in the classroom of an interactive whiteboard might affect the general attitude and enthusiasm of teachers. For example, teachers in our study noted that the boards had inspired them to add interesting resources to their material and had “given [them] a new lease of life”. Further research is needed here.

viii) *How are specific learning outcomes influenced by use of the interactive whiteboard?* Further investigation into targeted learning outcomes such as development of higher-order thinking skills, conceptual understanding of curriculum material, learner generation of materials, cooperative skills, and problem-solving is needed. There was little data in our study that highlighted these areas in particular, but their centrality in current teaching and learning indicates that these are important topics to investigate further.

ix) *What is the nature of ‘motivation’ in these projects and how does its development interact with pedagogy?* The area of motivation is extremely broad. We had evidence that motivation was developed or enhanced by the use of interactive whiteboards but the reasons for this increased motivation were not clear. The novelty factor could be a large part of this. We believe that a longer term study that focused only on this area would be of value.

### **6.10 Conclusion**

The study provides insights into teachers', administrators' and students' views about the value of IWBs as well as indications of the dominant pedagogies we observed being used with these boards, and the capacity of the boards to connect to the outside world. The technology was highly valued as a presentation technology that improves whole-class teaching procedures and encourages teachers to become more technologically fluent.

Critics of the technology suggest use of IWBs too often simply supports replication of traditional pedagogies. In this sense, the IWB could be perceived as a "jet-powered stagecoach" (Papert, 2004). However, we are hopeful, on the basis of this study, that a greater potential exists for the technology, which, with further familiarity and access, might develop and contribute to pedagogy in innovative and effective ways. Hedberg (2006) suggests that, to support 'more disruptive' pedagogies, ICTs that are usually used just for presenting and representing ideas need to be associated with "a range of interactive activities that employ digital resources provided by the teacher or generated by the learner" (p. 177). We suggest that such activities are very possible using IWBs. We use Ong's (2005) analogy of the printing press, which enabled what was known by a privileged few to be read by a large number of people across widespread locations, through a technology that was mainly replicative in nature. This replicative technology transformed education over time. This kind of transformation could occur with interactive whiteboards as they provide a portal to the world of ICT-rich resources and a catalyst to improved teaching practices.

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