Examining the ways that primary teachers (K-2) use interactive whiteboards in connection with their literacy-based pedagogical practices

Kay Hannelore Prcevich

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EXAMINING THE WAYS THAT PRIMARY TEACHERS (K–2) USE INTERACTIVE WHITEBOARDS IN CONNECTION WITH THEIR LITERACY-BASED PEDAGOGICAL PRACTICES

A thesis submitted in total fulfilment of the requirement for the award of the degree

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2013
DECLARATION

I, Kay Hannelore Prcevich, declare that this thesis, submitted in fulfilment of the requirements for the award of Doctor of Philosophy, in the School of Education, Faculty of Social Sciences, University of Wollongong, is wholly my own work unless otherwise referenced or acknowledged. The document has not been submitted for qualifications at any other academic institution.

Signed

Kay Hannelore Prcevich
07 August, 2013
Dedicated to Adam
ACKNOWLEDGEMENTS

It gives me great pleasure to thank those who helped make this research and thesis possible.

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ABSTRACT

In recent times there has been a significant increase in the use of interactive whiteboard (IWB) technology in NSW school classrooms. The upsurge of IWB technology has resulted in the expectation of major changes in educational settings, however, the literature indicates a different reality, suggesting that IWBs have not been used to their potential (Fitzallen, 2005; Kent, 2006; Kervin & Jones, 2009) with some papers suggesting the technology has been somewhat mislabelled (Burden, 2002; Lee & Boyle, 2003).

The purpose of this inquiry was to explore the ways that IWB technology has been implemented in NSW primary schools within literacy-based learning experiences. Specifically, it sought to examine the ways that primary teachers (K–2) use IWBs in connection with their literacy-based pedagogical practices. Potential participants were contacted through hierarchical order, starting with regional directors, in order to identify principals who, in turn, were asked to identify teachers. Ultimately, three K–2 teacher participants were identified based on specific participant criteria and recruited from three different NSW Department of Education and Training regions. The conceptual framework of Activity Theory (Engeström, 1996) was used to investigate the use of IWBs by the teachers, as their individual approaches to teaching, pedagogical beliefs and views on the role of technology on students’ learning were examined. The individual, classroom and school contexts were considered.

To enable in-depth exploration of the issues concerning the use of IWBs by K–2 teachers, a case study approach (Yin, 2003) was adopted. Accordingly, four methods of data collection were employed: semi-structured interviews with teachers and principals; classroom observations of literacy-based teaching/learning experiences (including audio, visual and photographic recordings); the collection of artefacts (including IWB-created material and student work samples); and semi-structured discussions with teachers following classroom observations.
The findings reveal how teachers’ use of IWB technology was supported within their whole-school and professional contexts. The findings highlight the extent to which IWBs were incorporated within the teachers’ pedagogical design and delivery of literacy learning experiences. Further, through the lens of Activity Theory and cross-case analyses, the findings identify critical components that contribute to effective use of IWB technology for literacy teaching and learning. These include: expectations of teacher use of IWB technology; teacher confidence with IWB technology and teacher training; access to IWB technology; resource availability and the technology affordances and literacy pedagogy these resources represent; the tension(s) between IWB use and pedagogical practices; the structure and sequence of literacy experiences; and, teachers’ pedagogical goals.
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<tr>
<td>DET</td>
<td>Department of Education and Training</td>
</tr>
<tr>
<td>BECTA</td>
<td>British Educational Communications and Technology Agency</td>
</tr>
<tr>
<td>ICT</td>
<td>Information and Communication Technology</td>
</tr>
<tr>
<td>IWB</td>
<td>Interactive Whiteboard</td>
</tr>
<tr>
<td>NSW</td>
<td>New South Wales</td>
</tr>
<tr>
<td>SERAP</td>
<td>State Education Research Approvals Process</td>
</tr>
<tr>
<td>UK</td>
<td>United Kingdom</td>
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<td>U.S.</td>
<td>United States of America</td>
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CHAPTER ONE – INTRODUCTION
1.1 INTRODUCTION

Over the past decade, there has been considerable global investment in Information and Communication Technology (ICT), in particular, interactive technology (NSW DET, 2009; Hall & Higgins, 2005; U.S. Department of Education, 2004). Between 1999 and 2000, the Australian government spent AUD$4.3 billion on ICTs across all levels of government organisations (Hall & Higgins, 2005). The British Educational Communications and Technology Agency estimated that between 2001 and 2004, £1 billion was spent on ICT in educational contexts in the United Kingdom (UK) (BECTA, 2004). Further, in 2004, according to the United States (U.S.) Department of Education, more than U.S. $700 million was allocated to educational technology in the U.S. (U.S. Department of Education, 2004). Thus, significant investment in ICT within educational contexts is apparent around the globe.

In the UK, the Department of Education and Skills (Cunningham, Kerr, McEune, Smith, & Harris, 2004) publicised that £50 million has embraced and invested in interactive whiteboards (IWBs) alone. The significant emphasis and investment that the UK government contributed to the adoption of IWB technology within classrooms have caused a ripple effect, as Australia too, appears to be embracing and investing in IWB technology in similar ways. For example, through the implementation of the Connected Classrooms Program, a program initiated by the NSW state government, between 2004 to 2011, AUD$66 million were invested into IWB technology within NSW public schools (NSW DET, 2009). However, while governments around the globe (in particular, the NSW government) are keen to promote IWB technology (NSW DET, 2009; Hall & Higgins, 2005; BECTA, 2004), it remains uncertain as to whether such investment and adoption of IWB technology are being converted into valuable and sustainable pedagogical practices.

IWBs have been incorporated into learning environments for over a decade now. Much of the early research conducted came from early adopters in the UK, the U.S., Canada and Australia, and was focused on the positive effects of IWB technology (Glover & Miller, 2002; Higgins, 2003; Kennewell; 2006). Since the availability of this technology has rapidly increased over the past few years (primarily due to government-funded initiatives),
it has led to an increase in research conducted on IWB technology within educational settings. However, the trend and current debate in literature on IWB technology in educational settings have focused on IWB use for a sophisticated transmission style of teaching, as opposed to authentic and constructivist approaches to teaching (Miller & Glover, 2002; Serow & Callingham, 2008; Vincent, 2007). Thus, it seems both timely and necessary to examine closely the potential and affordances of IWB technology for modern pedagogical approaches.

As the literature on IWB technology within educational settings has been predominantly focused on mathematics and science educational environments and practices, there is a need for detailed investigation into the use of IWB technology within literacy-based educational contexts. The continued examination of IWB use, focused on best practice and with the objective of understanding the pedagogical advantages and limitations, is essential to guide the effective practice of IWBs within classroom-based literacy teaching and learning experiences.

The inquiry draws on the conceptual framework of Activity Theory (Engeström, 1996) to investigate the ways that primary teachers (K–2) use and incorporate IWBs within literacy-based learning experiences. It adopts case study methods in order to enable in-depth exploration of the contemporary phenomenon of IWBs, their utilisation by three K–2 teachers within their classrooms and the literacy experiences they design and implement for their students. Thus, by investigating the ways that K–2 teachers use IWBs in connection with their literacy-based pedagogical practices, the inquiry aims to extend the currently limited understanding of how literacy pedagogy is developing in response to the influx of IWBs in NSW public school classrooms.
1.2 BACKGROUND OF THE INQUIRY

It is recognised that the current era is characterised by developments in ICT. This notion comes as no surprise, given that during the past decade the rate of classroom technology adoption has noticeably accelerated around the world (NSW DET, 2009; Kennewell, 2006; U.S. Department of Education, 2004). Such acceleration in technology adoption within classroom contexts has sparked many debates, particularly in relation to the promises made for such technologies (Kervin & Jones, 2009) as purposeful, effective and sustainable practices are examined.

There is some discussion in the literature suggesting that ICTs fail to provide teachers and students with the educational benefits that they (the teachers and students) were expecting, or, in fact, promised. Indeed, technology is often veiled with promises of transformation for teachers and their practices; however, in reality, this can be quite the opposite (Deaney, Ruthven, & Hennessy, 2003). It is argued by Kervin and Jones (2009) that “while educational researchers need to continue to explore the potential of ICTs, we need to move beyond the notion of ‘promise’ with technology and look to the critical role it plays” (p. 11). Apprehension for the expectations educators hold for IWB technology within their pedagogical environments and practices continues to be a topic of discussion, as the enthusiasm engendered by the novelty and uptake of IWB technology within educational settings appears no different from other forms of ICT. Thus, further investigation into the critical role and impact IWB technology has on teaching and learning environments and practices is essential.

The first IWB was manufactured by SMART Technologies Inc. in 1991 (SMART Technologies, 2008) and was originally developed for the corporate sector. However, since the late 1990s, government initiatives around the globe have seen IWB technology being transplanted from the business world, used as presentation devices and design tools, to classroom environments to facilitate and support learning experiences. In terms of educational settings, IWBs appear to have been used first in higher education (Murphy, Jain, & Spooner, 1995), with their potential for use in primary schools acknowledged.
(Moseley et al., 1999), as it became evident that K–12 schools around the world were beginning to integrate IWB technology into their classrooms.

The literature suggests that the UK is the world leader in the number of IWBs in classrooms (Arnott, 2004; Lewin, Scrimshaw, Somekh, & Haldane, 2009). The UK government has, and continues to, invest rapidly and substantially in IWB technology within classroom environments, and “The rate at which these still quite expensive items have permeated the UK schools sector is phenomenal” (Kennewell, 2006, p. 3). Between 2003 and 2005 the magnitude of investment for IWB technology in UK schools was reported to be over £50 million (Clarke, 2004; Lewin et al., 2009). By 2004, the UK government had actively begun to promote IWB technology in England, with Charles Clarke, the former Secretary of State for Education and Skills, expressing that, “every school of the future will have an IWB in every classroom” (Arnott, 2004). Consequently, it was reported that by the beginning of 2006, 94% of UK primary schools had purchased at least one IWB (BECTA, 2006) and further, by June 2006, there were an average of six IWBs per primary school and 16 per secondary school in the UK (British Educational Suppliers Association, 2006).

Given the significant amount of money that has been invested into IWB technology in the UK and regardless of the fact that there is need for educational research, it is believed by Smith, Higgins, Wall, and Miller (2005) that, “There is no doubt that this investment will have substantial impact on teaching and learning environments in UK schools” (p. 92). There is, however, extensive criticism about the use of IWBs in UK classrooms from a pedagogical perspective, with the accusation that IWBs make students ‘spectators’ rather than critical thinkers (Paton, 2007). Therefore, more-crucial aspects of IWB technology use, such as the impact of ICT on learning, it is argued, need to be considered (Cuban, 2001).

Although IWB technology is becoming increasingly present in Australian primary schools, the use of IWBs in Australian classrooms is reasonably new. It was recognised by the NSW Department of Education and Training (2009) that, “few schools have been using them for more than six years and most of them have been installing them over the past four years”
However, through the implementation of the NSW state government’s Connected Classrooms Program and other government initiatives, the number of IWBs installed in NSW public schools has dramatically increased since 2007.

In 2007, the NSW state government committed AUD$158 million investment over four years to enhance the Department of Education and Training’s ICT capacity for teaching and learning (NSW DET, 2009). This became known as the Connected Classrooms Program with the aim “to create the world’s largest collaborative learning community: By the end of 2011 every public school in the state will share these facilities and our children will benefit from being part of the world’s largest collaborative learning community” (NSW DET, 2009, para. 4). Three key projects are encompassed within the Connected Classrooms Program with one of these being the Interactive Classrooms Project, to which AUD$66 (of the AUD$158) million was pledged. This specific component of the program meant that every NSW public school would be equipped with an IWB and video-conferencing facilities with the purpose of enabling more students and teachers to benefit from learning with IWB technology (NSW DET, 2009).

The Connected Classrooms Program is the largest single investment in public education by the NSW state government (Beveridge, 2008) and installations for the entire Connected Classrooms Program were proposed to happen in a phased approach between June 2008 and June 2011. It was recorded in December of 2008, that “over six hundred NSW schools had already received interactive classrooms” (NSW DET, 2009, para. 3). It has been reported that the government’s decision for the implementation of the Connected Classrooms Program was generated from, “the demands of modern pedagogy and curricula … [as] … Teachers and students are entitled to access up-to-date, efficient, reliable and effective computer software, technology, email and Internet services, with proper technical support, appropriate professional development and time” (NSW DET, 2009, para. 5).

An online survey of the Connected Classrooms Program participating schools was conducted by the NSW Department of Education and Training after the first round of installations in 200 schools in June 2008. This online survey gained insights into the
installation experiences of these schools and an understanding was used to improve subsequent installations. The survey findings indicated that the majority of principals (92%) found the installation to meet their expectations and, further, that 69% of them were satisfied with the amount of information they had received (Beveridge, 2008). Positive comments suggested that “the equipment is excellent and in good working order” while “the installation date had changed a couple of times” and “when they (the installers) arrived, the room was unsuitable … our board was set up too low on the wall” were some negative comments made (Beveridge, 2008, p. 46). Numerous principals acknowledged that there were also “a few technical glitches” between the IWB being installed and ready for use (Beveridge, 2008, p. 47).

Deaney et al. (2003) argue that the supply of technology is of limited value without an understanding of “the interactions and processes engendered by using technology in different settings, and how pedagogical strategies to enhance students’ learning might be developed effectively through them” (p. 142). Findings from research on IWB technology within classroom environments suggests that IWB technology can reinforce teacher-centred pedagogy (Knight, Pennant, & Piggott, 2004), leading to students becoming passive recipients of information rather than active, engaged learners (Moss et al., 2007). Thus, the question about how much thought is actually given to teachers’ transition from teacher-centred practices to student-centred practices, through the use of IWB technology, appears to be a question that is alarmingly still unanswered.

It has been suggested that IWBs have been mislabelled (Burden, 2002; Fitzallen, 2005; Lee & Boyle, 2003). The ‘interactive’ component of its name remains quite debatable, as IWBs are not necessarily used interactively (Knight et al., 2004). Lee and Boyle (2003) support this argument and explain, “The generic term ‘interactive whiteboard’ fails to communicate the immense education capacity of the tool. In reality…the technology is a large-scale, digital convergence tool” (p. 4). Subsequently, if this is reality and IWB technology has been mislabelled, then is this causing educators to be misled in terms of what they can actually do with this particular type of technology in classroom environments? While
interactivity remains an important feature of what IWB technology can offer (Moss et al., 2007), a variety of options for its effective use need to be further explored (see section 2.3).

1.3 SIGNIFICANCE OF THE INQUIRY

New technological advancements (in particular IWB technology) present literacy with new teaching opportunities (Beavis, 2007), thus creating a need to acknowledge the responsibilities of a 21st century learning environment. Teachers need to move toward such reality, yet at the same time be informed and critical about when and how they choose to incorporate technology within their pedagogical practices. Further, teachers need to carefully consider the nexus between the affordances of IWB technology, the 21st century learning environment and knowledge of best literacy pedagogy.

By investigating the ways that primary teachers use IWBs in connection with their literacy-based pedagogical practices, this inquiry aims to make a significant contribution to the, currently limited pedagogical understandings for literacy teaching in K–2 classrooms. Further, the inquiry has the potential to make a significant and timely contribution to existing practical and conceptual knowledge of K–2 teachers’ use of IWBs in connection with their literacy-based pedagogical practices.

The practical significance of the inquiry includes examining the ways that competent and confident teachers incorporated IWBs within the pedagogical design and delivery of their literacy teaching and learning experiences. Such knowledge is valuable to educators as they consider how to best design and deliver pedagogically appropriate and most effective IWB literacy-based teaching and learning experiences.

It is also important to explore the degree of support provided to teachers at the whole-school and community levels as this, in turn, is likely to impact on the use of IWB technology in the individual classrooms. It was decided to draw upon Activity Theory (Engeström, 1996) as the conceptual framework for the inquiry, as it provides the researcher with a suitable lens to view the primary teachers’ literacy-based pedagogical
practices. Furthermore, it should highlight important insights into how, and for what purposes, IWB technology is incorporated within these practices. Such contribution allows us to understand the various processes within and between activity systems and, moreover, allows us to construct pedagogical models and approaches of IWB integration for teachers and their schools, based on such understandings.

The inquiry’s contribution, therefore, to the limited research that has been conducted on the ways that primary teachers use IWBs during literacy learning experiences has the potential to provide practical and conceptual insights into the effective use of IWB within teachers everyday pedagogical practices of their literacy-based teaching.

1.4 PURPOSE OF THE INQUIRY

Through descriptive analysis, in connection with the conceptual underpinnings of Activity Theory (Engeström, 1996), the purpose of this inquiry is to identify and examine the ways that three NSW K–2 teachers use and incorporate IWB technology within literacy-based learning experiences in their classrooms. By investigating the ways that K–2 teachers use IWBs in connection with their literacy-based pedagogical practices, this inquiry aims to extend the currently limited pedagogical understandings for technology integration and literacy teaching in these early years of school.

1.5 RESEARCH QUESTIONS

The primary research question to guide this inquiry is:

- How do primary teachers (K–2) use interactive whiteboards in connection with their literacy-based pedagogical practices?

Three sub-questions have been designed to further frame the inquiry and enable the researcher to explore this primary research question. These are:

- How are teachers’ use of interactive whiteboard technology supported within their whole-school and professional contexts?
• How are IWBs incorporated within the pedagogical design and delivery of literacy learning experiences?
• What affordances does interactive whiteboard technology offer for literacy teaching and learning?

1.6 CONCEPTUAL FRAMEWORK

The inquiry draws on Activity Theory as the conceptual framework to describe and analyse the ways that K–2 teachers use IWBs in connection with their literacy-based pedagogical practices. Activity Theory (Engeström, 1996) focuses on a collective object-orientated activity system as the primary unit of analysis, set within a larger network of systems (Lim & Hang, 2003). Activity Theory is used as a framework in order to provide a systematic method to examine IWB use by K–2 teachers within their literacy classrooms. Through adoption of this approach, the documentation and subsequent analysis of activity systems across teachers and their literacy classrooms can be conducted within each teacher’s respective whole-school system.

As teaching is a complex activity, with teaching approaches and classroom arrangements varying from one setting to another, adopting Activity Theory as a unit of analysis enables the researcher to observe the use of IWB technology as integrated in the actual processes of teachers’ pedagogical activities, as shaped by their context. More specifically, Activity Theory and its activity systems model (see Figure 3.1 in Chapter Three) can be used to analyse the relationship between the teachers’ (subject) pedagogical goals, i.e., what they were trying to achieve pedagogically (object), and how these goals in teaching literacy were assisted, or hindered, by the use of IWB technology (tool). This relationship between the technologies and teachers’ pedagogical goals is pivotal in defining of what constitutes an ‘effective’ use of the technologies such as an IWB in literacy classroom. (Dixon & Verenikina, 2013; Lim & Hang, 2003). Evidently, the interaction within all the activity components is essential for the technologies to allow the teachers to achieve their pedagogical goals, for example, the way that technologies are situated within larger social cultural contexts. The students in the classroom (community) and the interactions,
particularly physical interactions, they and the teachers have with the IWB, and at what times (division of labour), can also be closely considered. Thus, in sum, drawing upon Activity Theory as the conceptual framework for the inquiry provides the researcher with a lens to view the primary teachers’ literacy-based pedagogical practices and important insights into how IWB technology are most effectively incorporated within these.

1.7 Methodological Orientation

This inquiry employed a qualitative research approach, with the incorporation of case study design (Yin, 2003). The employment of qualitative data collection methods and analysis assisted to work toward the purpose and intentions of the investigation, that is, the inquiry of the ways that K–2 teachers use IWB technology in connection with their literacy-based pedagogical practices. The adoption of a case study approach enabled in-depth exploration of the issues concerning the utilisation of IWBs by three K–2 teachers. To serve the purpose of case study, three stages of data collection encompassing four methods of data collection were used (see Figure 4.2 in Chapter Four). The three stages of data collection were also carefully chosen by the researcher to respond to the research questions that framed the inquiry.

The first stage of data collection was conducted prior to entering into the field and was used to prepare the researcher for the field. There were two steps within this stage, including conducting semi-structured interviews with school principals and teachers, and the collection and analysis of school and teacher artefacts.

The second stage of data collection was during the researcher’s time in the field. Three steps were included within this stage: observing teacher participants use the IWB during literacy-based teaching and learning experiences; the collection and analysis of teacher participant artefacts; and semi-structured discussions with teacher participants. This stage was repeated four times with each of the three teacher participants. The third stage of data collection was after entering the field, which included a semi-structured interview with
each teacher participant. It was also during this stage that member checking of data collected took place.

The case study approach enabled the researcher to collect detailed data, thus allowing investigation of the experiences of three practitioners (in relation to literacy practices and IWB technology) into the use of IWB technology in K–2 literacy teaching. Such K–2 literacy-based teaching and learning experiences were examined and explored from the perspective of the conceptual framework, Activity Theory (Engeström, 1996).

1.8 LOCATION AND PARTICIPANTS
The inquiry is located within the NSW Department of Education and Training public school system. The NSW Department of Education and Training is a very large system, which, at the time of the inquiry, was divided into ten regions (NSW DEC, 2012). The ten NSW Department of Education and Training regions are illustrated in Figure 1.1.

Figure 1.1. NSW Department of Education and Training regions
Potential participants were contacted through hierarchical order (from regional directors to principals to teachers) and three K–2 teacher participants were recruited from three different NSW Department of Education and Training regions and were recruited in accordance with the following sampling criteria:

- **The grade the teacher participants are currently teaching** – Teacher participants must be currently full-time employed in a K–2 classroom;
- **The use and accessibility of an IWB** – Teacher participants must have access to and use an IWB on a ‘close to’ daily basis (and no less than twice a week) during literacy-based learning experiences;
- **Confidence and competence levels of IWB use** – Teacher participants must present reasonable levels of confidence and competence in relation to IWB use. It was anticipated that recruiting teacher participants who (on a ‘close to’ daily basis) use IWB technology during their literacy-based learning experiences, would present reasonable levels of confidence and competence with IWB technology; and,
- **Willing to Participate** – Teacher participants must be willing to participate in the inquiry.

The three participants finally chosen for the inquiry were Gabby, Kaitlyn and Declan. Gabby is an experienced late-career teacher who teaches at a public school located in the Northern Sydney region. Gabby has a composite Year One/Two (Stage 1) class. Kaitlyn is a mid-career teacher who teaches at a public school located in the Western Sydney region. Kaitlyn has a Kindergarten (Early Stage 1) class. Declan is a mid-career teacher who teaches at a public school located in the Illawarra and South East region. Declan has a Kindergarten (Early Stage 1) class.

At the time of the inquiry, all three teacher participants were employed full-time within NSW Department of Education and Training public Kindergarten to Year Two classrooms. At this point it is important to recognise that there are a number of different pathways into formal schooling across Australia, and the first three years of formal schooling in NSW are Kindergarten, Year One and Year Two, and are classified as the early years of primary school. Further, it is important to note that all syllabus/curriculum documents, policies and
procedures are consistent across the ten NSW Department of Education and Training regions and are mandatory documents across all NSW public schools (NSW DET, 2009). Thus, all three teacher participants and their schools are governed by this single jurisdiction.

At this point it is also important to acknowledge that the NSW Board of Studies is introducing a new syllabus, The NSW English K–10 Syllabus, that emerged from the Australian Curriculum: English, and is to be fully implemented by 2014. However, at the time of inquiry, and whilst writing this thesis, the NSW Board of Studies: English K–6 Syllabus (BoS, 1998) was the syllabus being implemented within NSW schools.

1.9 THESIS OVERVIEW

The thesis consists of six chapters. The following outline explains how the remainder of the thesis is organised.

1.9.1 CHAPTER TWO – LITERATURE REVIEW

Literature significant to this inquiry is reviewed in this chapter. The review consists of five sections. The first section defines IWB technology, as well as presenting a review of the literature on IWB technology, paying particular attention to the functions, affordances, practicalities, enablers and inhibitors of IWB technology. The second section identifies the characteristics of interactivity and interactive teaching, as well as identifying IWBs as a form of interactive technology. The pedagogical practices for technology use, particularly IWB technology use, are then presented in the third section. The fourth section reviews the literature on the changing nature of literacy practices, paying particular attention to the changing nature of literacy due to technology. Also within this fourth section, connections between literacy and social constructivist teaching and learning are identified and discussed in connection with the NSW Board of Studies: English K–6 Syllabus (BoS, 1998) curriculum document. In the fifth section of the literature review, literature on IWB technology in the early years in connection with literacy-based pedagogical practices is explicitly reviewed. It is particularly within this fifth and final section of the literature
review, that the need to conduct further research on K–2 teachers’ literacy-based pedagogical practices in connection with the effective use of such tool (IWB) is apparent.

1.9.2 CHAPTER THREE – CONCEPTUAL FRAMEWORK
The inquiry uses Activity Theory (Engeström, 1996) as its conceptual framework and it is within this chapter that Activity Theory is explored. An overview of Activity Theory is presented, followed by a discussion on how Activity Theory is applied to the inquiry. A detailed discussion of activity as a unit of analysis, both in general as well as in connection with the inquiry, is then presented. In the final section of this chapter, empirical research on Activity Theory is presented, as other applications of Activity Theory are discussed.

1.9.3 CHAPTER FOUR – METHODOLOGY
Chapter four presents a description of the methodology of the inquiry. The inquiry’s research questions are firstly presented. The inquiry’s research design (qualitative paradigm) is then examined, followed by the examination of case study design. A detailed discussion on the locus of the inquiry, such as ethical procedures and participants is then presented. The three stages of data collection are then presented, including a detailed discussion on data collection procedures (including semi-structured interviews, observations including audio and visual recordings, the collection of artefacts, and semi-structured discussions). Rationales for data collection methods in connection with each of the inquiry’s research questions is then presented, before providing reasoning for the inclusion of an audit trail. An examination of the data collection techniques selected and implemented within the inquiry is then analysed and discussed providing rationales for their necessity and purpose within the inquiry. In the final section of this chapter the credibility of data (such as triangulation, member checking and peer debriefing) are discussed, prior to a clear explanation of how teacher activities were identified and analysed in accordance with Activity Theory, the conceptual framework for the inquiry, being presented.
1.9.4 Chapter Five – Case Studies

Chapter five presents the data collected from three teacher participants involved in this inquiry. As this inquiry is an interpretivist inquiry, in-depth case studies have been developed to capture the perspectives and experiences of all three teacher participants: Gabby, Kaitlyn and Declan. Each of the three cases present different insights into the K–2 teachers’ use of IWBs within their literacy-based teaching and learning experiences.

The cases have been arranged according to the individual participants’ organisational (the school), personal (the teacher), social (the classroom) and professional (the activities) contexts. The first section introduces the school in which the teacher is currently working. Background information about the school setting, demographics of the school and the history of IWB technology within the school are presented. The teacher is then presented during the second section with detailed descriptions of their teaching expertise and IWB experiences. The third section describes the classroom in which the observations took place. Demographical information on the students in the class is presented, together with a description of the classroom layout and the position of the IWB in the classroom. The fourth section of each case details the IWB activities and the key movements within each experience as observed by the researcher. Also encompassed within the fourth section of each case is an interpretive summary of the key movements embedded within each of the IWB activities observed by the researcher. A summary of key points for the whole case is presented in the final section of each case.

1.9.5 Chapter Six – Discussion, Recommendations and Concluding Comments

Within the sixth and final chapter of this thesis, analysis from the participant cases is drawn on to make connections between and across cases in order to respond to the framing research questions. Cross-case analysis, informed by Activity Theory, revealed components contributing to effective use of IWB technology for literacy teaching and learning. Such components of effective use of IWB technology for literacy teaching and learning are firstly presented in a model, with pertinent components of the model being further discussed to provide in-depth discussion in responding to the overarching research question.
of how K–2 teachers use IWBs in connection with their literacy-based pedagogical practices. How teachers achieved effective (or otherwise) use of the IWB within their classroom literacy experiences is incorporated in an aim to provide further research and contributes to the limited knowledge and understanding of ‘effective’ IWB practices within K–2 literacy classrooms. Recommendations for future research directions are also presented within this chapter, before concluding comments in relation to the inquiry’s framing research questions are, lastly, presented.
CHAPTER TWO – LITERATURE REVIEW
2.1 INTRODUCTION

This inquiry examines three teachers’ use and implementation of interactive whiteboard (IWB) technology in their classrooms to support their literacy-based pedagogical practices. Activity Theory (Engeström, 1996) is the conceptual framework used within the inquiry, where the tool (the IWB and its related resources), the teacher (as an individual as well as their literacy-based teaching practices), the classroom environment (both the students and the classroom surrounds) along with the whole-school contexts, are considered.

There are five main sections of the literature review. The first section defines IWB technology, as well as presents a review of the literature on IWB technology, paying particular attention to the functions, affordances, practicalities, enablers and inhibitors of IWB technology. The second section identifies the characteristics of interactivity and interactive teaching, as well as identifies IWBs as a form of interactive technology. The pedagogical practices for technology use, particularly IWB technology use, are then presented in the third section. The fourth section reviews the literature on the changing nature of literacy practices, paying particular attention to the changing nature of literacy due to technology. It is within this fourth section that connections between literacy and social constructivist teaching and learning are identified and discussed in connection with the NSW Board of Studies: English K–6 Syllabus (BoS, 1998) curriculum document. In the final section of the literature review the literature on IWB technology in the early years of school in connection with literacy-based pedagogical practices is reviewed. Throughout this literature review, gaps and tensions in literature are identified to justify the need of this inquiry. Thus, the need to conduct further research on K–2 teachers’ literacy-based pedagogical practices in connection with the ‘effective’ use of such a tool (IWB) becomes apparent.

2.2 INTERACTIVE WHITEBOARD TECHNOLOGY

The literature review opens with a definition of interactive whiteboard (IWB) technology, before presenting a review of literature surrounding the functions and affordances of IWB technology and IWB learning objects. Literature surrounding the practicalities of IWB
technology placement within classrooms is then presented and critically reviewed, and it is within this section that both contextual and pedagogical factors are presented and critically reviewed.

2.2.1 Definition of an Interactive Whiteboard

An IWB is a large, touch-sensitive display board (similar size to a conventional whiteboard), sensitive to finger or stylus pens. Typically, the board is used in conjunction with a computer and a digital projector, allowing computer images to be displayed on the board by the digital projector. The images can be both seen and manipulated via the computer and/or the board. A diagram of a typical IWB classroom setup is included below.

![Diagram of IWB Classroom Setup]

*Figure 2.1. Interactive whiteboard classroom setup*
An IWB allows users to interact with a wide range of resources such as video, audio, text and images, access the Internet and video conference as well as write, type or draw on the board and then save, alter or print images/documents. This can be done using a finger, the IWB pen or keyboard, the computer keyboard or mouse or a cordless keyboard/mouse.

There are many different types of IWBs such as Promethean ActivBoards, InterWrite Boards and SMART Boards. Both Promethean ActivBoards and InterWrite Boards are IWBs that require the user to use a special pen, commonly referred to as a stylus pen. SMART Boards are a type of IWB that one can use their finger or a stylus pen to interact with and navigate on. The NSW Department of Education and Training selected SMART Boards in their ‘roll out’ during the Connected Classroom Program initiative (NSW DET, 2009). In this inquiry, SMART Boards were used within all three classrooms under investigation and all three teacher participants used the latest version of the SMART Notebook software (SMART Notebook 10).

### 2.2.2 Functions and Affordances of Interactive Whiteboard Technology

Typically, an IWB has a “computer control mode and writing mode” (Digregorio & Sobel-Lojeski, 2010, p. 258). In the computer control mode the IWB stylus pen or finger can act as a mouse (whereby a finger or stylus pen on the IWB screen acts the same as an interaction with a computer mouse). In the writing mode the IWB stylus pen or finger acts as an actual writing implement, whereby a finger or stylus pen can be used to produce digital ink on the IWB screen (Digregorio & Sobel-Lojeski, 2010).

The IWB marketing makes the claim that the IWB provides teachers with multiple opportunities to teach in new and exciting ways that far exceed the possibilities of traditional chalkboards (Ball, 2003; Hall & Higgins, 2005). This claim and others, such as the IWB being described as a combination of all previous non-digital teaching resources rolled into one: chalkboard, plain whiteboard, television, overhead projector, CD/DVD player, and classroom computer, are indeed contestable (Hall & Higgins, 2005). Functions of IWB technology include:
Affordances “refer to the design features in a technology environment that can support or constrain ‘doing’ or learning” (Way et al., 2009, p. 2). Moreover, John and Sutherland (2005) assert that such design features can extend students’ “capabilities as their [the technologies’] affordances are used to transform learning outcomes … [thus] extending and deepening classroom learning in ways hitherto unimagined” (p. 406). However, as “there is nothing inherent in technology that automatically guarantees learning” caution has been raised in assuming that technology will automatically afford specific learning outcomes (John & Sutherland, 2005, p. 406). Thus, careful consideration must be taken when designing and delivering teaching and learning experiences that involve IWB technology.

IWB technology can be used in a number of ways within classroom environments and its capacity in offering teachers and students varied opportunities in the classroom makes it a potentially powerful pedagogical tool. Lewin, Somekh, and Steadman (2008) define such pedagogy associated with the use of IWB technology as “the interactive process that goes on between teachers and children” (p. 293). More specifically, Digregorio and Sobel-
Lojeski (2010) suggest that, “effective teaching with IWBs requires pedagogy to contain an element of interactivity” (p. 265). It is suggested that the affordances of IWB technology allow for content to be interacted with by the teacher and students (i.e., via lessons created within the IWBs associated proprietary software or via the use of various forms of learning objects) (Kent & Holdway, 2007). However, such affordances of the IWB need to be used with care in order to construct pedagogically appropriate learner-specific teaching and learning environments.

2.2.2.1 Interactive Whiteboard Learning Objects

Learning objects refer to any digital resources that provide content to support learning. They are usually presented in a multimedia format and may consist of one or a combination of components, such as sound, graphic, text, video and animation (Miers, 2005).

As learning objects are digital resources, they can be digitally saved and stored, thus allowing them to be reusable. IWB learning objects are, therefore, reusable and the same learning object can be used in different situations for various intentions (Miers, 2005). Such abilities are viewed as efficient for literacy teachers, as they are able to save time and reuse already constructed IWB literacy lesson materials (whether they personally construct these, share resources within the school community or access such resources online) (Miers, 2005). However, the ability to reuse learning objects can be problematic for the literacy classroom, as teachers take advantage of the ability to reuse lesson materials and do not always carefully craft lesson materials for their students or for specific learning outcomes and objectives. Consequently, rich literacy environments based on syllabus outcomes and indicators can be unintentionally neglected and overridden by such digital resources (Namuth, Fritz, King, & Boren, 2005). The ability to reuse and share IWB resources is discussed in later sections of this literature review.

2.2.3 Practicalities of the Position of Interactive Whiteboard Technology

IWB technology needs to be part of the everyday life in the classroom (Glover & Miller, 2002; Miller & Glover, 2002). Further, for consistent IWB use, it is noted that teachers
need permanent IWB technology in their classrooms, rather than having to relocate their class to the IWB (Miller & Glover, 2002). Glover and Miller (2002) acknowledge that permanent IWB placement in classrooms is fundamental, as “the novelty value might provide a temporarily heightened interest but it was only when the full potential was realised that teaching could be enhanced” (p. 8). Thus, permanent acquisition of IWB technology within classroom environments seems fundamental in the endeavour to successfully integrate such technology into teaching and learning environments.

IWB technology positioned at the front of the classroom is said to assist teachers who are hesitant to engage and incorporate IWBs during teaching and learning experiences, as it is a familiar and comfortable pedagogic position (BECTA, 2003; Brown, 2003). The positioning of the IWB at the front of the classroom also allows the teacher to face the class whilst teaching using the IWB, rather than the teacher being physically removed from the visual presentation when using a computer to the side of the IWB and, worse still, may even be “more in tune with their laptop [rather] than with the students” (Wood, 2001, p. 3). Consequently, the positioning of the IWB at the front of the classroom can permit student-centred teaching and learning.

The positioning of permanently fixed IWBs has been largely criticised. Some argue that if they are placed too high or too low, students are unable to comfortably reach and/or see all parts of the screen (Canterbury Christ Church University College, 2003; Tameside MBC, 2003). Portable IWBs that are not a permanent fixture on a classroom wall can cause calibration issues as the IWB is constantly being moved. Permanently fixed IWBs in demountable classrooms can also present calibration issues, as the classroom moves and is often disrupted. Calibration issues and the constant need to realign an IWB can be a major inconvenience and disruption to lesson pace, for if an IWB is not calibrated then text/objects on the screen are not able to be moved freely and accurately and the writing of text directly onto the screen becomes interrupted and delayed.

The annoyance of having to stand to the side of the IWB whilst using it, to avoid casting a shadow across the screen has also been expressed in the literature (Smith, 2001; Walker,
2003). Also, it has been reported that students find it difficult to see materials presented on an IWB screen when teachers use unsuitable colours and fonts (Levy, 2002). Thus, teachers need to remain mindful of how their IWB is installed in their classroom, what additional measures (such as the installation of blinds) need to be taken in order to provide a practical and pedagogical supportive teaching and learning environment. Further, teachers also need to remain mindful of what and how they present lesson materials on the IWB and the purpose for these choices, for example, certain colours and fonts might make the screen look ‘fancy’ but might not be the most practical and easiest for students to see and/or read.

2.2.4 ENABLERS AND INHIBITORS OF IMPLEMENTING INTERACTIVE WHITEBOARD TECHNOLOGY

The literature suggests that there are many enablers and inhibitors of incorporating IWB technology within general classroom practices. Common enablers and inhibitors of IWB use identified in literature have been reviewed and organised into contextual and pedagogical factors.

2.2.4.1 Contextual Factors

Contextual factors of IWB use are important to consider as they assist in describing the direct and indirect links between the use of IWB technology within teachers’ literacy-based pedagogical practices and the outcomes achieved. Common contextual factors include teacher training and professional development, lesson preparation and implementation, and reusing and sharing resources. A critical review and synthesis of the literature surrounding the contextual factors of IWB use is presented below.

2.2.4.1.1 Teacher Training and Professional Development

There are many implications when incorporating IWB technology within classroom practices, with the many issues being in relation to teacher training and professional development, as well as teachers’ technical proficiency (Ball, 2003; Glover & Miller, 2001; Greenwell, 2002; Levy, 2002).
Adequate and appropriate IWB training and professional development opportunities that extend further than the technical aspects and explore the pedagogical aspects need to be invested in order to use IWBs effectively within classroom teaching practices. For instance, Hall and Higgins (2005) found, in their study focused on primary school students’ perceptions of IWBs, that there was a need for sufficient teacher training in the use of the IWB and the need to help promote a more accommodating, shared approach between teachers and students. Hall and Higgins (2005) assert that:

While the technology is clearly engaging from the students’ perspective, there is a concern that any gains in this direction may be lost if the technology is not reliable, if teachers are not adequately trained to use it and perhaps more importantly, if the educational climate militates against increased pupil access to the technology. (p. 114)

Interview data collected in Glover and Miller’s (2001) study found that the use of “slick presentation and high-quality prepared materials” (p. 261) during initial IWB training sessions conducted by IWB companies and suppliers appeared to be successful in creating initial enthusiasm for teachers to use IWB technology. However, if teachers are not provided with further support and training (beyond the initial training) their enthusiasm for the technology will most likely diminish, with the potential to hinder and discourage teachers’ intentions to use their IWB as a transformative pedagogical tool (Burden, 2002).

Thus, successful integration of any technology into classroom practice obviously involves more than merely acquiring that technology. IWB technology is no exception as Kennewell and Beauchamp (2007) acknowledge:

The current level of integration of IWBs into teachers’ pedagogical knowledge is an achievement which should not be underestimated, but if IWBs are to meet the expectations of policy makers and achieve the claims of practitioners, there may need to be a new wave of professional development in ICT which takes
account of the extended list of ICTs features and the need to embed them in teachers’ pedagogical knowledge and reasoning. (p. 240)

Further, Riel, Schwarz, and Hitt (2002) state that the integration of technology, “requires much more than buying equipment, it requires the knowledge and skills of teachers using the technology, and access to digital tools in the community” (p. 147). Thus, although the permanent placement of IWB technology is a critical factor toward the successful integration of IWB technology within classroom contexts, it is also crucial to consider other influential factors such as teacher training and professional development, all of which will contribute toward teachers’ acquisition of new and/or altered pedagogical approaches.

In sum, it is clear that IWB technology has been enthusiastically installed and embraced as a leading teaching resource within educational contexts, particularly primary school contexts. However, teachers can become easily discouraged to use IWB technology, causing the affordances of IWB technology to not be fully exploited if IWB training, technical support and assistance in developing pedagogy is inadequate. Teachers need the opportunity and time to gain confidence and expertise with such technology in order to adapt their pedagogical practices to create authentic and optimal literacy-based teaching and learning experiences when incorporating IWB technology into literacy teaching and learning experiences. Training beyond technical aspects and toward a focus on pedagogical aspects is deemed necessary. Further, continuing teacher training and development and reflection on pedagogy are essential for many teachers to be able to progress past a limited use of the affordances offered by IWB technology into a zone of productive pedagogy which “incorporates an array of teaching strategies that support classroom environments… across all key learning and year levels” (Kent & Holdway, 2007, p.3) with a strong emphasis on “raising the quality of teaching in terms of the intellectual experiences and the social learning” (Zevenbergen & Lerman, 2007, p.858).

2.2.4.1.2 Lesson Preparation and Implementation

The time required to prepare lessons using an IWB has been one of the most acknowledged issues within the literature in relation to incorporating IWB technology within general
classroom practices (Ball, 2003; BECTA, 2004; Glover & Miller, 2001; Levy, 2002). Thus, it is not surprising that the time spent on lesson preparation, whether it be to assist in advance preparation of lesson materials or to quicken the pace of lessons with the provision of smooth transitions between lessons (BECTA, 2004), is essential for successful IWB implementation and often leads to saving time overall.

Teachers can use the IWB to provide initial structure for their teaching (Cogill, 2003), as the IWB permits them to “prepare material in advance or construct it in front of a class” (Kennewell, Tanner, Jones, & Beauchamp, 2008, p. 61). Teachers’ use of prepared IWB materials can also quicken the pace of lessons, thus reducing the need to write on the board (Ball, 2003; Glover & Miller, 2001; Miller, 2003) and, further, assist in the smooth transition of lessons (Ball, 2003; Latham, 2002).

Smith, Hardman and Higgins (2006) report that the use of an IWB increases lesson pace. They argue this is because pauses in lessons utilising the IWB were significantly shorter compared to lessons that did not use the IWB (Smith et al., 2006). They found that while the pace of lessons increased due to the inclusion of the IWB, the use of IWBs did not stimulate teachers’ pedagogy to evolve or develop (Smith et al., 2006). Further, there was a decline in extended answers from students, and fewer occurrences where teachers made connections or extensions to students’ responses were also noted (Smith et al., 2006). Other studies provided similar findings; with the possibility to increase the pace of lessons, teachers are deviating “in response to pupils’ needs and indeed might notice pupils’ needs less frequently” (Zevenbergen & Lerman, 2007, p. 861). These studies seem to suggest that there is a need for teachers to re-examine time in relation to pedagogy. The time spent on IWB lesson preparation is important, but more importantly, there is a need to focus on the support of pedagogical goals and time, rather than focusing on the time issue alone.

2.2.4.1.3 Reusing and Sharing Resources

It has been noted that IWB technology use can support and facilitate learning, as the IWB has the facility to save and then retrieve and reuse materials which have been prepared for lessons or created within previous lessons (Glover & Miller, 2002). These facilities can
restore the balance of creating resources and lesson preparation (BECTA, 2004). An evaluation of the Primary Schools Whiteboard Expansion Project in the UK reported that, “many teachers have made radical changes to their lesson planning, creating or accessing their own resources and storing them in either personal or shared areas on the school’s server” (Somekh et al., 2007, p. 8). Thus, the use of the IWB as a storage space has the potential to reduce teacher workload (Kennewell, 2004), as resources can be stored for a later date as well as shared among teachers (i.e., via a shared online space such as the school’s Intranet).

The importance of sharing ideas, resources and knowledge between teachers has been reported within literature (McCabe & Emery, 2003; Miller & Glover, 2002). For example, McCabe and Emery (2003) acknowledge that collating and sharing knowledge, concerns, ideas, resources and information, as well as assisting each other to fix/overcome technical problems, was advantageous to the teachers’ IWB development. As teachers can learn from each other during shared environments and experiences, it is also advantageous for teachers to observe the IWB technology being used and modelled by other teachers, thus allowing insight into the possibilities and potential of IWB technology (Miller & Glover, 2002).

However, the ability to save, share and reuse lesson materials within the literacy curriculum is not always regarded as the most pedagogically appropriate (Zevenbergen & Lerman, 2007). This is because literacy lessons should be specifically designed and delivered in accordance with the teachers’ knowledge of the students’ skills and abilities in the class, as opposed to allowing the ‘tool’ (the IWB) to take over, causing the teacher to present prepared general and unspecific, literacy-based learning experiences (Smith et al., 2006). Moreover, the ability to reuse literacy-created IWB learning resources has also become increasingly questionable in a climate of curriculum change (Smith et al., 2006; Zevenbergen & Lerman, 2007).

2.2.4.2 Pedagogical Factors

Pedagogical factors associated with IWB use are important to consider as they provide insight and understanding into how IWBs as a tool for teaching and learning are most
effective (or otherwise) within classroom contexts. Pedagogical factors of IWB use may include whole-class teaching, and promoting students’ motivation, engagement and attention, with a review of the literature on each of these factors being presented. Interactivity in connection with IWB use is discussed at length in subsequent sections.

2.2.4.2.1 Whole-class Teaching

The use of IWB technology has been noted to support whole-class teaching (Glover & Miller, 2001), as the user is able to quickly retrieve material for whole-class display, and further, “manipulate items directly on the IWB” (Kennewell et al., 2008, p. 61). With their large display screen, IWBs are suited to whole-class teaching. However, many warn that IWBs can reinforce teacher-centred styles of pedagogy if they are not used interactively (Armstrong et al., 2005; Smith et al., 2006).

It has been commonly reported that whole-class IWB use in primary school classrooms has a tendency to create communities where teachers and students learn together and from each other (McCabe & Emery, 2003; Miller & Glover, 2002). With their large display screen, McCormack and Ward (2003) report that IWBs promote students’ opportunity to take control and responsibility for their own learning and, thus, promote opportunity to “expand possibilities for collaboration and construction of knowledge” (p. 82). Hodge and Anderson (2007) acknowledge that when whole-class joint discussion takes place between students and the teacher about the materials presented on the IWB, the “spirit of enquiry” is “enhanced” and the “class learning community” is “strengthened” (p. 280). Thus, IWB technology has the ability to display joint products, constructed within a collaborative teaching and learning environment. It is through such IWB collaborative abilities that student-centred practices are more likely to be supported. However, tensions exist and one might query in what way is discussion ‘strengthened’? Are all students actively engaged in the ‘spirit of enquiry’ or are some marginalised due to the focus on whole-class use of the IWB? Finally, we should ask when is it better pedagogical practice to work with small groups at the IWB?
IWB technology has the potential to transform whole-class teaching practices when incorporated into classroom contexts. However, to support effective IWB use, IWB lesson materials and resources should be carefully crafted and constructed in ways that are content specific, as well as promote interactivity during whole-class teaching and learning experiences.

2.2.4.2.2 Promoting Students’ Motivation, Engagement and Attention

It is noted by Digregorio and Sobel-Lojeski (2010) that “motivation, behaviour and attention represent an overall student attitude in the classroom” (p. 262), and one of the most common affordances of IWB use asserted within literature is its potential to increase student motivation (BECTA, 2003; Beeland, 2002; Hall & Higgins, 2005; Levy, 2002; Schmid, 2008).

IWBs can be used as a presentation device and it has been noted that this, in itself, can be motivating for students (Miller & Glover, 2002). However, in order to create optimal literacy teaching and learning environments teachers must be aware that IWBs are much more than simply a means of projection. IWB technology needs to be carefully incorporated within subject-specific teaching and learning practices for student motivation to be enhanced (Martin, 2007). As such, K–2 teachers using IWB technology within their literacy classrooms need to be mindful of their use of such a tool and how their use and incorporation of such a tool motivates (or otherwise) their students.

Students’ motivation is affected by the type, quality and degree of interaction that takes place with the IWB (Digregorio & Sobel-Lojeski, 2010). Although it has been noted that motivation and attention can be increased if students interact with the IWB themselves (Digregorio & Sobel-Lojeski, 2010), fundamentally, motivation relies on the pedagogical quality of the teaching and learning experience (Schroeder, 2007). When planning and preparing literacy-based teaching and learning experiences with the incorporation of the IWB, K–2 literacy teachers need to consider the frequency, type and quality of physical interactions they intend the students to have with the IWB during these specific literacy experiences, in an aim to maintain and increase students’ motivation.
The IWB’s visual capability (i.e., its multimedia aspects) is one of the main IWB features noted to support and promote motivation (Smith et al., 2006). Resources created and presented using IWB technology are noted to be appealing to both teachers and students (Ball, 2003; Kennewell, 2004), thus better engaging students (Wall, Higgins, & Smith, 2005) and capturing and embracing students’ attention (Beeland, 2002) much more strongly than other classroom resources (Smith et al., 2005). Labbo, Eakle, and Montero (2002) proposed a four-step digital language experience approach involving using technology (such as photographs on computers) in traditional literacy Kindergarten classrooms. Their approach was:

1. Selecting an experience to capture (including who will take the photos and how many will be taken);
2. Photographing the actual experience while students engage in the selected experience;
3. Using the photographs from the experience, such as viewing the photographs, recalling the experience through the viewing of photographs, selecting and arranging photographs, and including multimedia effects (such as music etc.) to construct a story; and,
4. Connecting these digital language experiences with other literacy experiences (i.e., independent follow-up experiences related to the digital experience just constructed).

(Labbo et al., 2002)

In connection with IWB technology, such an approach (using photographs of students’ experiences to construct digital stories) can exploit the visual capability of IWB technology and has the potential to support and stimulate literacy teaching and learning.

As teachers become more confident and experienced with the functions of IWBs it is more likely that they will shape their pedagogy in response to the students’ engagement and enjoyment reactions, as they deliberately make decisions about the nature of the learning and interaction patterns they wish to create. For example, in Ruster’s (2008) study a teacher
chose to frequently utilise software packages and web resources, justifying their frequent utilisation of such resources on the students’ positive reaction to these easily accessible resources. However, it is argued that the IWB’s capability to gain students’ attention does not immediately guarantee sound pedagogical teaching and learning experiences as “the technologically impressive features of the IWB can lead to it being used to close down further the possibility of rich communications and interactions in the classroom” (Zevenbergen & Lerman, 2007, p. 861). Further, expectations placed on teachers to incorporate IWB technology within their teaching practices can lead to excessive use of such technology (Thornbury, 2009). Thus, teachers need to remain mindful of what they choose to use the IWB for and how, in an aim to incorporate IWB technology in pedagogically appropriate ways.

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In summary, much has been written about the potential of IWB technologies (e.g., Hall & Higgins, 2005; Levy, 2002; Miller & Glover, 2006; Schmid, 2008) and it is recognised that teachers need to use technological tools (such as IWB technology) in pedagogically sound ways to support existing practices (Gillen, Staarman, Littleton, Mercer, & Twiner, 2007; Hennessy, Deaney, Ruthven, & Winterbottom, 2007). However, there is little empirical evidence suggesting pedagogical change (e.g., Smith et al., 2006), with teachers’ initial use of IWB technology being the reproduction of existing resources in whole-class delivery rather than the development of a wider range of pedagogical strategies that are inclusive of IWB use (Kennewell, 2006; Lewin et al., 2009). Thus, teacher professional development must move beyond the acquisition of technical skills in the use of the board, thereby supporting the individual teacher’s exploration of their current pedagogy while offering the possibility of extending or transforming existing practice.

### 2.3 Interactivity and Interactive Teaching

At this point, it is important that interactivity and interactive teaching are discussed. The next section reviews the literature surrounding the characteristics of interactivity and interactive teaching, before identifying IWBs as a form of interactive technology.
2.3.1 CHARACTERISTICS OF INTERACTIVITY AND INTERACTIVE TEACHING

The definitions of interactivity, within the reviewed literature, are quite often based on and around how this characteristic can enhance students’ learning. For example, interactivity is defined as “the function of information and communication technology [ICT] which enables rapid and dynamic feedback and response” (Department for Education and Employment, 1999, p. 11), and for quite some time now has been regarded as “a key affordance of ICT that teachers and learners should exploit in support of effective learning” (Tanner, Jones, Kennewell, & Beauchamp, 2005, p. 6). Although interactivity “can be considered at individual, small group, whole class or school levels” (Rudd, 2007, p. 8), regardless of the technology, it is acknowledged by Latane (2002) that interactivity needs to be student–student as well as student–teacher. Thus, interactive teaching is suggested to have a profound degree of student participation and autonomy.

The inclusion of IWB technology within classroom contexts does not automatically promote and/or guarantee interactivity any more than conventional boards (Burden, 2002; Hall & Higgins, 2005). Although IWB technology alone cannot promote interactivity, IWB technology may not necessarily limit interactivity. Teachers’ pedagogical practices and their eagerness to use IWB technology within their pedagogical practices are pivotal. Rudd (2007) acknowledged that interactivity is promoted and interactions with the IWB are enhanced when teachers acquire knowledge of the IWB’s interactive components and affordances and, further, teachers use this knowledge in connection with their enthusiasm to use IWB technology. Such pedagogical interactions are likely to reflect productive pedagogical interactivity (Miller, Glover, & Averis, 2004) as they are “more likely to have greater ‘fit’ for purpose and are developed with the specific intention of placing learners more centrally in the learning experience” (Rudd, 2007, p. 7). Thus, interactivity is a complex notion and merely placing IWB technology within classroom contexts does not mean that it will be used interactively (Gibson, 2001).

Tanner et al. (2005) contend that in early literature on IWB use in classroom contexts, it was argued that teachers should engage in more ‘direct teaching’. However, more recent research indicates that the language has changed and the term ‘interactive teaching’ (in
particular, interactive whole-class teaching) appears to be the latest vernacular. Due to its ‘interactive’ nature (as well as its many other features), interactive technologies, such as IWBs, have and continue to become increasingly present within primary school classroom environments. As a consequence of the increasing presence of IWBs within primary school and classroom contexts over the last decade, primary teachers have come under intense pressure to change the ways they teach.

Moreover, the rapid pace at which technology is changing within classroom environments means that teachers are constantly encountering new forms of technology as well as encountering the excitement that comes with such novel technologies. However, such rapid pace of ‘new’ technology inclusion and replacement of ‘old’ technologies within classroom settings has caused limited opportunity to deeply explore notions of interactivity (Armstrong et al., 2005). This is because teachers appear to ‘move on’ and change technologies before really acknowledging and reflecting upon what has happened and how this technology has impacted, altered and/or changed their pedagogical practices. For example, a study conducted by Loveless (2003) found that teachers expressed concern about the demands placed upon them to keep up with the changes in technology as well as “expressed feelings of needing to ‘keep up’ with the cultural phenomena of irrevocability and rapid pace” (p. 318) of the integration of technology within classroom practices. Thus, there seems a need to further examine current classroom technologies, such as IWB technology and how such technology impacts on teachers’ teaching and learning practices.

In summary, IWBs might have limited impact when teachers do not realise that to fully exploit the interactivity potential of the IWB also “requires a new approach to pedagogy” (Armstrong et al., 2005, p. 456). Although IWB technology possesses features that could potentially be employed by teachers to benefit teaching and learning, it is understood that, in order to utilise these features, teachers are required to broaden their pedagogical skills and rethink their pedagogical approaches. Such understanding emphasises the need to consider the ‘best’ approach to enable the development of teachers’ competence, confidence and understanding of how to effectively utilise IWB technology in an interactive manner within their teaching and learning practices (Armstrong et al., 2005).
Thus, it is clear that further investigation into the nature of teachers’ pedagogical practices when utilising the IWB is essential in order to determine the most-effective approaches to using IWB technology.

### 2.3.2 **Interactive Whiteboards as a Form of Interactive Technology**

IWB technology has been identified as a form of interactive technology because of its “convergence of a broad range of technologies” (Way et al., 2009, p. 2). Further, it has been identified that the inclusion of IWBs has changed the ecology of the classroom and the perceptions teachers have of their role within the classroom (Cuthell, 2006). Thus, the introduction of IWBs in primary school classrooms, it seems, has generated a profound shift in the existing reality of teaching.

It is argued by many that IWB technology is an ‘interactive’ teaching tool and, through its affordances, can facilitate creating a “high level of interaction – students enjoy interacting physically with the board, manipulating text and images” (BECTA, 2003, p. 3). However, while the IWB affords the opportunity for teachers and students to interact with it in a way that text and pictures can be moved and replaced, changed and minimised, Shenton and Pagett (2007) question whether this truly promotes, “an interactive style of teaching and learning … [and] is it the board that is interactive and/or does the use of the board encourage an interactive style of teaching?” (p. 130). Similarly, Kennewell and Higgins (2007) suggest that:

> Although IWBs are used to encourage student participation, this can be very superficial; as asking students to take turns to manipulate items on the board does not necessarily represent opportunities for authentic student engagement or participation. Where teachers maintain perspective control of the IWB it is less likely to be used in a truly interactive manner for teaching and learning. (p. 209)

It has been claimed that there is often a tendency for teachers to stay in front of the class and control the IWB lesson, teacher-centred teaching and learning is reinforced (Schuck &
Kearney, 2007). Moreover, teachers need to be mindful that IWB technology should be incorporated in ways that support pedagogy and, in particular, they should view the technology as a tool that can promote the delivery of teaching and learning experiences in an attractive, engaging and interactive manner (Kennewell et al., 2008; Miller & Glover, 2002).

Smith et al. (2005) assert that the advantage of IWB technology lies in the opportunities IWB technology offers for “collective meaning making through both dialogic interaction with one another, and physical interaction with the board” (p. 99). Further, Smith et al. (2005) acknowledge that the use of IWB technology to promote students’ active participation in an interactive environment is a way to transform pedagogical practices. However, it is reported that this is fairly irregular (Kennewell et al., 2008; Miller & Glover, 2002; Vincent, 2007; Zevenbergen & Lerman, 2007). This obvious tension in the literature requires researchers’ attention. How are the opportunities Smith et al. (2005) allude to best taken up? What needs to be put in place for this to occur?

Glover and Miller (2002) assert that teachers need to recognise that there is a considerable interactivity associated with the use of IWBs and “interactivity requires a new approach to pedagogy” (p. 257). However, Beauchamp and Parkinson (2005) warn that the processes involved in assisting teachers’ development of interactive practices are complex for, as Higgins et al. (2007) explain, technological interactivity does not necessarily convert to pedagogical interactivity. They suggest that this is due to the significant difference between the technological interactivity afforded by the IWB and the pedagogical interactivity afforded by the mediate properties of the IWB (Higgins et al., 2007).

Smith et al. (2005) highlight the need for further research “if practitioners are to use IWB technology in the future as transformational devices … and ensure this technology is more fully understood and more coherently conceptualised” (p. 99). Further, many teachers appear to reluctantly appreciate that a new approach to pedagogy is fundamental for interactivity, with Miller and Glover (2002) suggesting that IWBs can, in fact, promote a pedagogical approach that fails to radicalise pedagogy, as opposed to becoming a catalyst
for changing pedagogy. With this said, how are teachers embracing IWB technology and how does (and how should) teachers’ uptake of IWB technology differ from their uptake of other forms of ICTs?

2.4 PEDAGOGICAL PRACTICES FOR TECHNOLOGY USE

Now that IWB technology is defined and identified as a form of interactive technology, literature surrounding pedagogical practices for technology use is in need of review. Generally speaking, teacher uptake of technology (such as ICT) is firstly presented before focusing on the literature surrounding teacher uptake of IWB technology.

2.4.1 TEACHER UPTAKE OF TECHNOLOGY

ICT refers to any digital technology that allows the electronic storage, distribution and access of information (i.e., smartphones, computers, the Internet, communication mediums etc.) and the urge to incorporate ICTs into educational practices is not a new phenomenon. It is noted that ICT is essential for 21st century learning environments (SMART Technologies, 2008) and ICT may contribute to creating powerful learning environments in numerous ways, as “it provides opportunities to access an abundance of information using multiple information resources and allow the viewing of information from multiple perspectives” (Smeets, 2005, p. 344). However, it is important to recognise that ICT integration within classroom practice requires more than simply providing access to the technologies (Vrasidas & Glass, 2005). Thus, ICT needs to be integrated in a way that supports and transforms pedagogy and it should be viewed as a tool that promotes teachers’ delivery of learning experiences in an engaging manner.

As we assume that teachers have substantial understandings about their profession we, more specifically, assume that they have substantial knowledge and understanding about what ‘good’ pedagogy actually is when incorporating technology within their teaching practices (Vardy, Kervin, & Reid, 2007). However, as asserted by Kervin and Jones (2009), “teachers are experts in pedagogy, but not necessarily in technology” (p. 2). It is described by Roblyer (2006) that technology is “a channel for helping teachers communicate better
with students. It can make good teaching even better, but it cannot make bad teaching
good” (p. v). Further, Vardy et al. (2007) explain that technology needs to be:

used in ways that are both authentic and pedagogically appropriate for the
nominated curriculum focus … and needs to support the philosophy of the
teacher and be integrated into classroom experiences in ways that contributes to
their pedagogical expertise and knowledge of their students. (p. 70)

Thus, it is essential that teachers carefully consider how they decide to integrate IWB
technology within their pedagogical practices. Curriculum/syllabus documents, individual
students’ knowledge and preferred teaching and learning environments, as well as the
teachers’ own pedagogical attitudes and beliefs, should be closely considered when making
such decisions, for technology cannot single-handedly promote pedagogy.

The integration of ICT within teachers’ pedagogical practices “requires a careful process of
collaboration between teachers and experts, successful experience in teaching with the
technologies, and participation in a community that provides continuous support” (Hedberg
& Freebody, 2007, p. 7). As many teachers have not used ICT-based learning strategies as
learners themselves before, nor had training or previous experience in teaching with such
technologies, in most cases, a number of these aspects are absent (Hedberg & Freebody,
2007). Thus, the rapidly changing technological context in which classroom learning
experiences take place prove to make the challenges for teachers increasingly more difficult
(Hedberg & Freebody, 2007).

History tends to suggest that whenever a new technology is introduced into society, there is
a tendency to use it to replicate the existing technologies that it has been designed to
replace (Burden, 2002). Further, Heppell (2001) discusses the impact of technology and
asserts, “We continually make the error of subjugating technology to our present practice
rather than allowing it to free us from the tyranny of our mistakes” (p. xvi). This paradigm
also applies to educational settings, for the capability of technology to “transform our
educational infrastructure is immense, but is still far from achieved … as the potential benefits of any new technology lie in how it is used” (Burden, 2002, p. 3–4). It has been noted by Staley (2004) that there is a tendency for technology to be overused to the point that the technology is purposefully incorporated within teaching and learning experiences to replace the physical presence of the teacher. Further, it is noted by Smeets (2005) that, “most teachers do not make use of the potential of ICT … [and] computers are used mainly to complement rather than change existing pedagogical practice” (p. 353). Justification for such practices is offered by Gray, Pilkington, Hagger-Vaughan, and Tomkins (2007), who reason that teachers have their own firmly fixed and established sets of beliefs and values that are extremely resistant to change.

Teacher disinclination to embrace new technology placed within their schools and classrooms has been acknowledged as the biggest issue preventing the successful assimilation of technology within educational contexts (e.g., Durrant & Green, 2000). Further, it has been accepted that in order to recognise the capabilities of ICT within classroom contexts and how teachers are using such technologies, “the study of pedagogy and didactics is crucial” (Kennewell, 2006, p. 1), for “technology by itself does not change practice – people do” (Burden, 2002, p. 6). As Higgins et al. (2007) assert:

Good teaching remains good teaching with or without the technology; the technology might enhance the pedagogy only if the teachers and pupils engaged with it and understood its potential in such a way that the technology is not seen as an end in itself but as another pedagogical means to achieve teaching and learning goals. (p. 217)

Thus, teachers are required to be competent and critical users of ICT. A critical user of ICT within classroom environments can be defined as one who not only presents an ability to use technology in ways that will enhance teaching and learning, but one who also initiates pedagogical change and defies educational practices in order to integrate ICT into the curriculum (Durrant & Green, 2000). Teachers who use IWB technology in such ways are identified by Rudd (2007) as experienced users of IWB technology and such users and
stages of IWB integration within classroom environments are discussed in a later section (2.4.2) of this literature review.

However, although ICTs have been in educational settings for quite some time now and support structures have been put in place for these forms of technology, why is ICT use in classrooms still on the research agenda? (Kervin, Jones, & Verenikina, 2010). It has been acknowledged by Leu, O’Byrne, Zawilinski, McVerry, and Everett-Cacopardo (2009) that the focus has remained primarily on the technology and in isolation from other subject areas, which has “led to a less productive set of policies” (p. 265). Thus, a shift in focus needs to occur, as technology must be framed as a curriculum issue in order for ICTs (such as IWB technology) to be successfully integrated within primary school curriculum demands (Leu et al., 2009). This shift in focus will allow more authentic and meaningful classroom experiences to occur, as primary teachers are presented with a pedagogically sound curriculum encompassing technology. As this issue is still in the research forefront, it is suggested that further investigation into ‘effective’ technology use within classroom settings, such as K–2 literacy settings, is necessary in order to contribute knowledge and understanding of how technology (such as IWBs) is most effectively integrated within modern curricula (such as the K–2 literacy curriculum).

**2.4.2 Teacher Uptake of Interactive Whiteboard Technology**

IWB technology and its inclusion into classroom contexts “is an exciting new development … as it challenges assumptions on the role of technology in learning” (BECTA, 2004, p. 2). However, the novelty factor of IWB technology has been discussed by many, suggesting that the novelty of IWB technology may decrease as students’ familiarisation with the technology increases (BECTA, 2003; Levy, 2002; Miller & Glover, 2002). A study conducted on the impact of IWBs on pedagogy and student performance (Moss et al., 2007), commissioned by the Department of Education and Skills (from the Institute of Education, UK), uses case studies to present an evaluation of IWB practice in London schools, along with an inconclusive statistical analysis of student achievement data. The study’s findings highlight that the novelty of IWB soon wears off and they (IWBs) are no solution. In fact, when used ‘badly’, IWB use reinforces ‘bad’ teaching, and may diminish
‘good’ teaching; with the potential to slow down rather than speed up learning (Moss et al., 2007).

IWBs are used in many different ways within educational settings. However, like any form of interactive technology, IWBs prove no exception and “will only truly enhance learning if they are used well” (BECTA, 2004, p. 27). Further, the saying, ‘It’s not what you use, it’s how you use it’ (Virtual Learning, 2003, p. 4) occurs frequently within the IWB-based literature. This denotes that what the teacher does with an IWB is much more important than the nature of the IWB itself (Kennewell, 2006). Thus, it is apparent that the transitional power of technology in teaching and learning is dependent on its use.

In connection to IWB technology and its perceived ability to transform classroom practices, the common expression, ‘it’s not the technology, it’s the teacher’ has never been so true (Kent, 2006). Meaning, it is not the tool (IWB) that transforms classroom practices but, instead, the way teachers use and incorporate such a tool (IWB) within their pedagogical practices. When using an IWB, it has been noted that teachers tend to position themselves at the front of the class, thus reinforcing teacher-centred practices (Maor, 2003). Burden (2002) discusses the tendency for new technologies to be “initially used to replicate rather than transform”, and further, “the danger of IWBs being used simply as a glorified blackboard” (p. 4). Simply using an IWB as a ‘glorified blackboard/whiteboard’ or as an extension of the 1870 Victorian model of the blackboard, promotes the reinforcement of old behaviourist teaching models (where the teacher talks at the students) (Burden, 2002).

McCormick and Scrimshaw (2001) denote that unless the technology is viewed as more than an aid to efficiency, or an extension device, the potential of IWB technology may not be realised, thus reinforcing existing teaching practices (Hall & Higgins, 2005), instead of supporting the transformation of teaching practices. Kervin and Jones (2009) advise that, as teachers expand their pedagogical practices to embrace new technologies, “they need to articulate the way their teaching ‘looks’ as a complex network of interaction and learning occurring between teachers, students and technology” (p. 2). Thus, IWB technology needs to be viewed as a tool for teaching rather than a teacher within classroom contexts. It needs
to be understood that successful use of IWB technology within classroom contexts can only occur when teachers exploit the principles of teaching and learning (Goodison, 2003; McCormack & Ward, 2003).

"Teaching with an IWB is an evolutionary process" (Kent, 2006, p. 9). It is cited by many (Beauchamp, 2004; Kent, 2006; Pilkington & Gray, 2004; Tanner et al., 2005) that there is a distinct progression (from novice to experienced/effective use) that teachers demonstrate during their adoption of IWB technology within their pedagogical practices. As such, a significant amount of research has been conducted on the earlier stages of IWB technology adoption within classroom practices (technical), as opposed to the latter stages (pedagogical). Literature on the stages of IWB technology adoption is further presented and reviewed.

During the initial ‘settling in’ stage of IWB integration into classroom practices, teachers demonstrate a tendency to reproduce what they were doing on a conventional whiteboard (Kent, 2006). According to Glover et al. (2005, 2007), this stage is labelled as the ‘supported didactic’ stage and is the first of three stages (supported didactic stage, interactive stage and enhanced interactivity stage) teachers’ interactivity progresses through when using an IWB. During this initial stage, the IWB is used as a visual support (Glover et al., 2005, 2007).

This notion is also noted by Tanner et al. (2005) who state that in the early stages of use the IWB is “treated typically as a blackboard/whiteboard substitute and serves to reinforce traditional pedagogies as teachers pass through a period of de-skilling and technological vulnerability” (p. 725–726). Kennewell, Tanner and Parkinson (2000) further note that teachers hardly modify or alter their pedagogical practices when using IWB technology during this initial stage. Glover and Miller (2001) believe this is because “teachers are hesitant about changing pedagogy in case they are let down by their ineptitude with the basic technology” (p. 267). Further, Tanner et al. (2005) noted that it is during this time, “access to the technology is controlled and mediated by the teacher” (p. 725). As a consequence, students’ interactions with the IWB are limited and teacher-centred practices
are reinforced while teachers are familiarising themselves with the technology. Pilkington and Gray (2004), emphasise the importance of this stage, as they deem the need for a technological ‘settling in’ period before teachers can be expected to concentrate on the development of pedagogy.

A study by Moss et al. (2007) on IWBs as a method for the development of interactive pedagogy identified this initial period of IWB integration as technical interactivity, “where the focus is on interacting with technological facilities of the IWB” (p. 40). However, given that there is less teacher interaction with students and more teacher interaction with the technology, it has been noted by Higgins et al. (2007) that this category of interactivity may result in higher incidences of teacher-centred learning. Further, Smith et al. (2005) identify that there is an expectation that teachers use IWBs within their classrooms, and that teachers hold an expectation that the technical interactivity offered by IWB technology will automatically result in the development of more-interactive teaching.

Once the initial/familiarisation period with the IWB technology is reached, the possibilities of the technology and its associated software can prove increasingly valuable (Cuthell, 2006). It is at this point that the IWB requires students’ attention, as it becomes the central part of the teaching and learning experience. Glover et al. (2005, 2007) identify the next stage of interactivity as the ‘interactive’ stage. It is during this stage that teachers demonstrate a willingness to share their IWB knowledge and expertise, while demonstrating a lack in confidence on a limited basis (Digregorio & Sobel-Lojeski, 2010). Further, Moss et al. (2007) identify this second period of IWB integration as conceptual interactivity, “where the focus is on interacting with, exploring and constructing curriculum concepts and ideas (interaction between students to co-construct knowledge)” (p. 40). Also during this stage, teachers begin to search for new approaches to pedagogy (Glover et al., 2005, 2007; Miller, Averis, Door, & Glover, 2005). However, the rate at which teachers explore the various features of the IWB technology to gain confidence, increase their competence and are able to change their pedagogical practices (in order to ‘tap’ into the potential of the IWB) varies greatly among individuals (Kent, 2006).
Beauchamp (2004) argues that it is during the process when a teacher-user of IWB technology progresses from being a ‘novice’ to one who integrates IWB technology within their range of pedagogical practices, that teacher training and professional development is essential for teachers to advance their IWB technical competence in conjunction with their pedagogical expertise. At this stage, the IWB allows teachers to do things differently, not just more effectively, as it “fundamentally becomes a constructivist tool – transforming learning from a process which is essentially about knowledge accrual, to one which is focused on knowledge creation” (Burden, 2002, p. 7). It is acknowledged by McCormick and Scrimshaw (2001) that the prompt transformation in teachers’ practices, from the presentation of superficial IWB attractive materials to materials that maintain and extend students’ motivation and attention through making use of the interactive affordance of IWB technology must occur. This meaning that “The emphasis has shifted significantly from the use of the board essentially as a presentational tool … to its use as an interactive tool to enable learners to be involved in the process of learning” (Burden, 2002, p. 9).

Glover et al. (2005, 2007) identify this stage as the third and final stage of interactivity, labelling it as the ‘enhanced interactivity’ stage. It is within this stage that the teacher looks for ways to assimilate lesson concepts and materials in a manner that makes full use of the interactive aptitude of the IWB (Miller et al., 2005). It is also within this stage that teachers show a willingness for pedagogic change and begin to realise that it is themself (the teacher) that plays the central role in creating experiences that promote interactivity through their selection of IWB software and hardware (Higgins et al., 2007). Thus, this stage of interactivity is the most productive and pedagogically supported stage for IWB use within classroom contexts (Glover et al., 2005, 2007).

Moss et al. (2007) identified this final period of IWB integration as physical interactivity, “where the focus is on ‘going up to the front’ and manipulating elements on the IWB” (p. 40). According to the three categories identified by Moss et al. (2007), it is understood that the full potential of IWB technology is not being exploited in the first two interactivity categories: technical and conceptual. For changes in pedagogic practice to occur, IWB technology must be embedded in teachers’ pedagogy as a mediating artefact for both their
interactions with their students and their students’ interactions with each other (Lewin et al., 2008).

In saying this, however, it is important to understand that this stage (the experienced/effective use stage) of the progression of IWB user development is fairly uncommon within primary school classrooms and it is further noted by Kervin and Jones (2009) that although encouraged, “the inclusion of (IWB) technology in classroom situations does not always appear to be guided by strong pedagogical principles” (p. 11). A lot of energy, time and perseverance is needed in order for teachers to progress through these stages and the investment of teacher time and expertise to enact this process is vital.

Rudd (2007) questions whether the above IWB stages and adoption models “denote some sort of linear progression and whether or not all schools and teachers will reach the transformation [experienced/effective use] stage over time” (p. 5). This appears improbable, with some teachers finding it difficult to progress from the initial familiarisation stage and, primarily, continue to use the IWB in a teacher-centred manner (Rudd, 2007). It is believed that such situations and cases are influenced by individual teachers’ pedagogical approaches as well as the ethos of the school.

In summary, as many researchers have emphasised the stages of IWB integration and use, it is becoming increasingly more apparent that changed pedagogy is essential for the successful integration of IWB technology within classroom contexts (McCormick & Scrimshaw, 2001). The ways that primary teachers’ pedagogical practices, specifically their literacy-based pedagogical practices, change in connection with their use of IWB technology and the stage of IWB integration that they are currently in (i.e., settling in/supported didactic/technical, interactive/conceptual, enhanced interactivity/experienced/effective/physical), are yet to be explored and identified.
2.5 The Changing Nature of Literacy Practices

In order for rich literacy experiences to occur, teachers need to be aware of the changing nature of literacy and how these changes impact on their literacy practices both within their classroom and whole-school contexts. At this point it is important to discuss the changing nature of literacy, particularly with respect to the rapid growth of technology within our classrooms, as well as the changing nature of literacy in connection with social constructivist teaching and learning. Such factors are discussed in-depth in subsequent sections.

2.5.1 The Changing Nature of Literacy Due to Technology

Traditionally, the definition of literacy and what it means to be literate has been limited to reading, writing and one’s capability to read and write. However, the definition of literacy and what it means to be literate has always been in a constant state of evolution (Leu, Kinzer, Coiro, & Cammack, 2004) and the nature of literacy is noted to be much broader than traditionally perceived (DEETYA, 2009; Gee, 1990; Kress, 2003; Street, 1995).

Gee (1990) defines literacy as a social practice and acknowledges that the traditional meaning of literacy, which restricts literacy to an ability to read and write, positions literacy in the individual rather than in the social worlds in which individuals actively participate. In support of Gee (1990), and limiting literacy to events that involve reading and writing, Street (1995) broadens the scope to ‘literacy practices’, which take into account “the behaviour and the social and cultural conceptualisations that give meaning to the uses of reading and/or writing” (p. 2). Further, Kress (2003) argues that the nature of literacy has changed and, “it is no longer possible to think about literacy in isolation from a vast array of social, technological and economic factors” (p. 1). In support of such perspectives, the National Curriculum Board (2009), explains that the definition of literacy now draws attention to:

the multiple capabilities that go together to make up a fluent and effective member of a literate society, the requirement that people now need to be fluent and effective in both traditional and new communication technologies, the need
for these capabilities to be responsive to different contexts of use, and the need for these capabilities to be systematically maintained over time. (p. 3)

Thus, literacy involves a broad range of knowledge and skills beyond reading and writing, which are embedded in a socio-cultural context.

As ICT continues to make its way into primary school literacy classrooms, such changes in technology have altered what it means to be literate, thus, leading to new conceptualisations of literacy. As such, teachers are faced with challenges that this changing nature of literacy presents to them and their classroom practices. Leu (2000) reflects on the impact of ICT on literacy and asserts:

Traditionally, we have selected teachers who were already literate and could pass their literacy along to our children. Now, however, the very nature of literacy is regularly changing because of new information and communication technologies. Many teachers literate in older technologies quickly become illiterate as newer technologies of information and communication replace previous technologies … we must begin to develop strategies to help each of us keep up with the continually changing definitions of literacy that will exist in our world. (p. 763)

Devoted to generating an accurate and deep understanding of ICT use and its capability to improve literacy proficiency of all students in Australia (through funding professional development and research), the National Literacy and Numeracy Plan (DEETYA, 1999) acknowledges that literacy achievement is impacted by teachers’ technology approaches and capabilities. As such, and due to the evolution of such perspectives surrounding literacy, teachers are required to be flexible and able to learn, acquire and teach new literacy practices as they continue to emerge (particularly in accordance with access to IWB technology).
Teachers need continual hands-on training in using technology within their literacy-based teaching and learning practices and the importance of teachers’ ongoing professional development, to assist in their use of classroom technology across all curriculum areas, has been reiterated by many (Means & Olson, 1995; Valdez et al., 1999). Further, Leu (2000) emphasises the need for teacher development to “continually support teachers as new technologies regularly appear” (p. 757). As technologies, such as IWBs, are flooding their way into primary schools around the globe, many teachers are faced with the challenge of teaching literacy proficiency (such as those expectations presented in current government curriculum policies/documents), while at the same time becoming competent users of the latest classroom technology (such as IWB technology) to teach literacy using IWB technology. As such, teachers should be continually provided with opportunities to attend regular training that enables them (as literacy educators) to become proficient in using the technology (such as IWBs) and related literacy software. Further, and of utmost importance, this training should assist teachers to gain knowledge of how to successfully integrate these technologies (such as IWB technology) into their literacy-based pedagogical practices.

For quite some time, the incorporation of technology within teachers’ literacy-based teaching and learning practices has been regarded as supportive, as teachers increasingly rely on a variety of different forms of technology and technological resources to support their literacy-based pedagogical practices. However, Labbo (2006) states that it is “the best of times and the worst of times for literacy pedagogy in the educational era of the new electronic, digital and information driven millennium” (p. 200). Modern technology (such as IWBs) demand changes to the nature of literacy (Leu & Kinzer, 2000). As such, teachers are in a constant pedagogical battle between the pressures of modern digital literacy (such as new literacies, multiliteracies and multimodal literacy) and traditional literacy practices.

In summary, teachers are required to carefully craft literacy teaching and learning experiences specifically for the students in their class, making sure to be aware of the changing nature of literacy and literate practices both within school and outside school contexts. Further, teachers have a challenge of creating and fostering such environments
when incorporating technology, such as IWB technology within their literacy practices. As the literature is limited, it is at this particular point (where the IWB is used as a tool to support literacy teaching and learning) where scepticism remains. Thus, further investigation into how the IWB as a tool for literacy teaching and learning can be incorporated in ways that foster authentic literacy-based teaching and learning experiences is deemed necessary.

2.5.2 LITERACY TEACHING AND SOCIAL CONSTRUCTIVIST TEACHING AND LEARNING

Traditionally, the role of the teacher within teaching and learning focused on direct instruction, whereby it is “the active and directive role assumed by the teacher, who maintains control of the pace, sequence, and content of the lesson” (Palincsar, 2005, p. 286). Baumann (1988) further defines direct instruction as being:

The teacher, in a face-to-face-reasonably formal manner, tells, shows, models, demonstrates, teaches the skill to be learned. The keyword here is teacher, for it is the teacher who is in command of the learning situation and leads the lesson, as opposed to having instruction ‘directed’ by a worksheet, kit, learning centre, or workbook. (p. 714)

However, since the late 1970s a tendency has been noted toward a “socio-cultural revolution” in relation to teaching and learning (Voss, Wiley, & Carretero, 1995, p. 174). Traditional transmission-style teaching practices, with the role of the teacher being the central controller of the learning environment, has shifted to understanding teaching as the process of creating learning environments that facilitate the “acquisition of intellectual skills through social interaction” (Palincsar, 2005, p. 285).

Social constructivist perspectives of teaching and learning are derived from constructivist perspectives, with the differences being in relation to “the extent to which the social dimension of development is refined and also how relations between the social and the personal are conceptualised” (Daniels, 2001, p. 37). From a constructivist perspective,
learners construct their own knowledge through being active discoverers and creators of meaning in interaction with the environment and people (Piaget, 1977). From a social constructivist perspective, social interactions are crucial in this process, with learning occurring within multiple levels of social and cultural contexts (Vygotsky, 1978).

The work of Vygotsky is of high significance to contemporary social constructivist views of teaching and learning, as it “attempts to theorise and provide methodological tools for investigating the processes by which social, cultural and historical factors shape human functioning” (Daniels, 2001, p. 1). Vygotsky (1978) asserted that learning is the process by which learners are integrated into a knowledge community, with all cognitive functions beginning from social interactions. Thus, the social constructivist approach accentuates that learning takes place in a socio-cultural setting, such as classroom, school or wider community.

Based on social constructivist thinking, with the role of literacy teachers in mind, the researcher has drawn attention to understanding learning as an active process that can be analysed as a socially mediated and culturally situated activity. Teaching within the zone of proximal development, an educator aims for learning to eventually become a self-regulated process. The above principles are further discussed in connection with the expectations of K–2 literacy teaching and learning (i.e., BoS, 1998).

### 2.5.2.1 Learning is an Active Process

Constructivists view learning as being interactive, not only in the sense that learners must interact with a source of ideas/knowledge, but also in the sense that learners must actively participate in the reconstruction of ideas/knowledge within their own mind (Piaget, 1926). From a constructivist perspective, students should not be passive receivers of information but, instead, should actively construct their knowledge through building and extending their schemas, applying metacognitive strategies and interacting with the environment (Piaget, 1926). Thus, learning takes effort on the part of the learner (Geary, 1995) and the process of learning takes place when students engage with the environment in an attempt to make sense of the world around them.
Within constructivist environments, teachers provide tools for learners to create meaning, as opposed to the teacher conveying knowledge to the learner. Jonassen (1992) emphasised that the identification of tools necessary for learners to construct knowledge is essential, rather than simply identifying specific knowledge. From a constructivist point of view, technologies are seen as cultural tools that can be used to communicate, exchange information and construct knowledge (Jonassen, 1996; Vygotsky, 1978).

From a social constructivist perspective, meaning is constructed through shared experiences (Daniels, 2001), as opposed to being transferred from teacher to learner. Further from a social constructivist perspective, during interactions between teacher and learner, it is the teacher’s role to assist learners to make sense of the world by assisting learners to “attach meaning to the objects and events around them” (McDevitt & Ormrod, 2002, p. 136). Dialogue plays a mediational role between the teacher and learner, leading to further learning. Thus, joint discussion is a fundamental mediational tool for meaning construction (Vygotsky, 1978).

Luke (2000) argues that, in order for students to become fully involved in reading, students must be provided with opportunities to contribute to the co-construction of meaning from texts. It is through questioning and discussion of texts read (prior, during or after being read), that teachers are able to stimulate and support students’ own meaning making. Questions need to be based on text awareness, more so than text content (Wilson, 2003), and the most-effective text awareness questions are those that help students gain insight into aspects such as the way texts are structured (BoS, 1998; Wilson, 2003). Such practices involve the teacher creating supportive environments that encourage students’ active participation in meaning making, as opposed to the teacher adopting a dominative direct instruction ‘traditional’ role (Baumann, 1988).

According to the NSW Board of Studies: K–2 Literacy Foundation Statements (BoS, 2007), teachers are expected to create literacy learning environments and experiences that support students in developing “awareness of the basic grammar and punctuation needed to produce simple texts” (BoS, 2007, p. 4), support students in “using an increasing variety of skills and strategies including context, grammar, word usage and phonics to make
connections between their own experiences and information in texts” (when reading and viewing texts) (BoS, 2007, p. 6), as well as support students’ “awareness of different purposes, audiences and subject matter” within their writing (BoS, 2007, p. 6). The use and exploration of technology to actively construct knowledge, such as to construct/produce texts, is also expected within such syllabus documents (BoS, 2007).

Further, according to the NSW Board of Studies: K–2 Literacy Foundation Statements (BoS, 2007), as well as the outcomes and indicators presented within the NSW Board of Studies: K–6 English Syllabus (BoS, 1998), K–2 teachers are expected to create environments that foster and support students’ active participation and contribution to literacy teaching and learning experiences. More specifically, teachers are expected to encourage students to create their own meaning from texts (BoS, 1998), rather than impose their own interpretation of the meaning upon them. Such meaning creation can be supported and encouraged through teachers’ appropriate questioning.

2.5.2.2 Learning is a Socially and Culturally Situated Activity

From a social constructivist approach, students best learn in collaboration with others when their knowledge and understanding are socially constructed (Smagorinsky, 2007; Vygotsky, 1978). Further, social constructivists recognise that communication, dialogue, interactions and the production of knowledge during social interactions are integral facets of learning (Vygotsky, 1978).

In line with such social constructivist perspectives and approaches, Palincsar and Brown (1984, 1989) designed a reading technique teaching strategy called reciprocal teaching whereby teachers and students engage in a structured discussion regarding specific segments of a text by adopting “four strategies – predicting, questioning, summarising, and clarifying – to engage readers in constructing the meaning of a text and monitoring to determine that … [students make] sense of the text” (Palincsar, 1998, p. 348). The prediction strategy involves the combination of the reader’s prior knowledge, knowledge acquired from the text as well as the structure of the text in order to make predictions about a text (Doolittle, Hicks, Triplett, Nichols, & Young, 2006). Predictions about a text could
be based around questions such as, what will the author discuss next in the text? (Palincsar & Brown, 1984). The questioning strategy can be based on generating questions about and around the significant concepts, themes and information within a text, thus allowing the text to be explored more deeply and ensuring the construction of meaning (Doolittle et al., 2006). The clarification strategy assists in the identification and clarification of any difficult or unfamiliar aspects of a text (e.g., sentence structure, vocabulary, ideas) in an aim to reduce and eliminate confusion (Doolittle et al., 2006). The summarising strategy is based on the identification of significant concepts, themes and information within a text and using this information to construct a statement (of varied lengths) that conveys the critical meaning of the text (Doolittle et al., 2006).

From this perspective, social constructivists profoundly view students as social beings that actively construct knowledge and meaning by drawing on their existing knowledge and beliefs through participating in the social processes of a learning environment (Stage, Muller, Kinzie, & Simmons, 1998). Further, social constructivists view meaning making as the process of sharing various perspectives and experiences in communities of practice (Fosnot & Perry, 2005; Lave & Wenger, 1991; Vrasidas, 2000). It is through the students’ active participation within their social world/learning environment that learning is primarily viewed as a social product, facilitated by the processes of conversation, discussion and negotiation (Confrey, 1995; Ernest, 1995; Woo & Reeves, 2007). Thus, learners transform their knowledge and beliefs (constructed during/within social learning environments) into internalised processes (Palincsar, 2005). From this point of view, students (and teachers) bring their personally experienced theories and perspectives to any new learning situation and these, in turn, influence what information they focus on and thus what knowledge they construct (Jonassen, 1999; Sutherland et al., 2004). Within this context, the teacher has an important role in creating environments that support whole-class, small group and paired interactions that encourage the social construction of knowledge.

Social constructivists consider learning as a social practice and students’ literacy learning is closely connected to the interactions and connections they have with others. According to the NSW Board of Studies: K–2 Literacy Foundation Statements (BoS, 2007), teachers are
expected to provide students with opportunities to interact with others in an aim to develop appropriate skills to “interact effectively in the classroom and in groups” (BoS, 2007, p. 4). Further, the NSW Board of Studies: K–2 Literacy Foundation Statements (BoS, 2007) also state that teachers are required to provide students with the opportunity to:

Communicate with a wide range of people on familiar and introduced topics to achieve a variety of purposes … interact effectively, adopting new speaking skills … share ideas with peers to complete tasks … [as well as] recognise that spoken language has a range of purposes and audiences and use their knowledge when attempting to communicate effectively with others. (p. 6)

Within a K–2 literacy classroom, as indicated within the NSW Board of Studies: English K–6 Syllabus (BoS, 1998), teachers are expected to create learning experiences and environments that promote and assist in the development of students’ talking and listening skills. Such teaching and learning experiences include audience/subject matter (i.e., both informal and formal interactions), listening (including awareness of gestures and facial expressions), interaction (i.e., contributes to small and whole-class experiences) and oral presentation (i.e., appropriately conveying meaning). Further, as students’ experiences with literacy and their evolving understandings of literacy vary according to individual social practices (McNaughton, 1995), teachers are required to comprehend literacy as a social practice that is embedded within daily events and incorporate experiences that involve students interacting with everyday texts (Barton & Hamilton, 2000). Thus, as students bring to the classroom a history of learning experiences that relate to their previous social and cultural experiences (both in and out of school) (Stage et al., 1998), teachers need to carefully design and deliver daily literacy learning experiences that relate to students’ social learning experiences.

Due to inborn characteristics (such as intelligence) as well as external factors that affect them (such as environment, other people, etc.), students learn at different rates (Anderson, 1996; Vygotsky, 1978). From a social constructivist perspective, learning is viewed as an interactive process, as learners interact with more-knowledgeable members of their culture.
in their zone of proximal development, as well as adopt an active role in reconstructing ideas/knowledge within their own minds (Vygotsky, 1978). As learning is a socially situated activity that is enhanced in meaningful contexts, the role of the ‘other’ is emphasised as a significant part of the learning process, whereby an individual is supported or ‘scaffolded’ by another (whether it be peers or the teacher) to be further challenged and complete a more-challenging task that they would not normally be able to complete independently (Vygotsky, 1978).

Bruner (1985) further describes the link between language and culture from a social constructivist perspective to argue:

Aspirant members of a culture learn from their tutors, the vicars of their culture, how to understand the world … There is no way, none, in which the human being could possibly master that world without the aid and assistance of others for, in fact, that world is others. (p. 32)

The role of the ‘other’ is significant as they have the position in knowledge construction as co-constructors of knowledge within socially/culturally organised activities (Vygotsky, 1978). Further, teachers (as the ‘other’) are required to add depth to experiences in order to create and enhance meaningful contexts as well as create and include tasks that challenge their students to perform beyond their current capability.

Thus, from a social constructivist approach, the role of the teacher in creating and managing a task is of fundamental importance, as it is the teacher who is the stimulus (rather than just a facilitator) in assisting or scaffolding the student that is of significant importance. Through modelled, guided and independent reading, teachers are able to scaffold students’ reading development and students are able to learn from experienced literacy users to become independent readers (BoS, 1998). As students are exposed to and progress through the teaching and learning cycle (such as modelled, guided and independent reading) they are exposed to a number of different strategies presented by the
teacher, all of which should be reflective of the students’ zone of proximal development (BoS, 1998).

For example, teachers read aloud to the students, modelling the rhythm, sound and sense of written language (BoS, 1998), thus allowing “students to see what it means to enter into dialogue with the text” (Wilson, 2003, p. 3). Shared reading takes place during modelled reading times, as students are invited to interact with the print in an effort to scaffold students’ knowledge and understanding of text comprehension and contextual word recognition (BoS, 1998). Making predictions about the text, making connections between students’ prior knowledge and the text as well as the identification of characters within the text are also ways to invite students to interact with the text (Harris, Turbill, Fitzsimmons, & McKenzie, 2006).

According to the NSW Board of Studies: K–2 Literacy Foundation Statements (BoS, 2007) and the NSW Board of Studies: K–6 English Syllabus (BoS, 1998), teachers are expected to create environments for students to interact “and talk with peers, teachers and known adults” (BoS, 2007, p.4) on subject matter less familiar to the student and more familiar to the other (i.e., peer, teacher and/or adult). It is through guided reading that teachers can scaffold students’ reading (usually independently or in small groups), by interacting with them in the individual student’s zone of proximal development (Vygotsky, 1978). Interactions in the zone of proximal development occur when teachers offer students new strategies to process new, less-familiar and more-challenging texts. It is the students’ application of these strategies to new texts that leads them to become fluent and independent readers (Harris et al., 2006). Thus, it is through adoption of such practices that teachers aim to lead students to become proficient/self-regulated users of language.

Although teacher support is essential in scaffolding, according to the social constructivist approach to teaching and learning, peer scaffolding should also be encouraged in an aim to provide students with freedom from teacher-fronted classroom settings (Wilson, 2003). An inquiry into how seven-to-nine year old students taught each other how to write stories was conducted by Daiute and Dalton (1993). They noted that the peer collaboration that took
place reflected teacher and student interactions, thus resulting in the production of new story elements and the production of more-advanced writing than students could independently produce. Daiute and Dalton (1993) further noted that the students’ sharing of personal perceptions when collaboratively constructing texts during peer scaffolding, contributed to a higher quality of work produced (as opposed to the writing produced in collaboration with the teacher and students). However, although students are given freedom to work together and such practices are in contrast to those traditional, teacher-directed/centred practices, teacher support is still necessary and scaffolding before and during individual or small group tasks is crucial (Wilson, 2003).

Thus, from a social constructivist perspective students’ interactions with their social environment (such as the wider school environment, the classroom and specific experiences within the classroom environment, such as constructing meaning from texts) are critical and must not be discounted (Airasian & Walsh, 1997).

2.6 Interactive Whiteboard Technology and Pedagogical Practices in Literacy Teaching

The literature on IWB technology within educational practices is increasing as IWB technology continues to make its way into classroom contexts. However, limited research has been conducted on the use of IWB technology within K–2 literacy-based learning environments. Within this section of the literature review, research conducted on IWB use within classrooms where students are less than six years of age (prior to Kindergarten) is firstly presented and examined. Because there is limited research on IWB use within early years (K–2) classrooms, to showcase different strategies, research conducted on IWB use within Year 2 to Year 6 primary classrooms is then presented and examined. Finally, the limited research that has been conducted on IWBs in the early school years (K–2) classrooms, especially in relation to literacy teaching and learning, is explored.
Terreni (2009) studied a group of nine children (aged three-to-four) to investigate the use of IWBs for visual art learning in kindergarten classrooms. Some findings from her research indicate that:

- The way the IWB was used by the children reflected the teachers’ knowledge and experience of early childhood visual art pedagogy;
- What was seen as good practice for young children’s visual art learning experiences with traditional art mediums was also applied to the digital art learning experiences on the IWB, which was seen as another visual art ‘tool’ which could mediate children’s thinking and assist their learning;
- The central location of the IWB and its large size were important, that is, the location of the IWB in the area where children had their group mat-times enabled the teachers to use the IWB easily with the large group;
- The technical complexity of the IWB appeared to foster teachers’ engagement with the children’s visual art learning experiences using the technology; and,
- Children’s storytelling using their drawings appeared to be motivated and encouraged by the IWB. This process enhanced both their visual art skills and oral literacy.

Although identifying a number of concerns of IWB use “in particular the need for appropriate professional development for teachers to help them maximise the potential of the IWB for early childhood teaching” (Terreni, 2009, p. i), Terreni (2009) concludes that IWBs can be a useful tool for motivating and assisting young children with visual art learning experiences.

Gilroy (2005) examined the effects on teaching and learning of IWB use in a Year 6 (ten-year-old children) classroom in Auckland, New Zealand. Her findings spread across the New Zealand curriculum, noting that the IWB played a major role in all areas of English (oral, visual, written language and reading). This was through lessons such as daily news, modelling writing, poetry and reading groups.

Gilroy (2005) and Lee and Boyle (2003) identified affordances offered by IWB technology in supporting students’ developmental abilities. These affordances included:
• IWBs allowed the students physical access to the board, where they were presented with tactile opportunities (appropriate for kinaesthetic learners) to manipulate objects/text directly onto the screen;
• IWBs captured students’ attention immediately, which improved whole-class learning;
• IWBs permitted teachers to demonstrate and model how to seek and locate information, based on students’ interests and responses; and,
• IWBs allowed the immediate storage and retrieval of students’ work, permitting the reviewing of students’ work on the IWB.

Although not age-specific to the age under investigation in this inquiry (K–2), findings from the previously reported studies can contribute (or otherwise) to the limited knowledge and understandings of IWB use within preschool and primary school contexts. Further, findings from these studies can contribute (or otherwise) to the limited knowledge and understandings of IWB use within literacy contexts.

While many researchers have focused on IWB use within education (for example, Gilroy, 2005; Kuzminsky, 2008; Lee & Boyle, 2003), limited empirical research, both nationally and internationally, has focused on IWBs in the early school years (K–2) classrooms, especially in relation to literacy teaching and learning. Some instances that have been able to be located will be examined.

Lee and Boyle (2003) investigated the use of IWBs in Kindergarten to Year 6 classrooms (children aged five-ten) at Richardson Primary School, Australia. They reported that, “the use of ICT by the children is now the norm from kindergarten onwards” (Lee & Boyle, 2003, p. 17). In relation to the early years Lee and Boyle (2003) explained that, “because the young can simply use their finger or a pen, and don’t have to work a keyboard, there are no inhibitions about making a contribution” (p. 17). Lee and Boyle (2003) further noted that:

of particular importance to the younger children was the tactile nature of the medium, that ready ability to engage with the material on the board and for the
children to use their finger nail to open files, to write or simply to highlight a point. (p. 15)

Thus, IWBs may enable children in the early years of primary school to learn through “actively exploring and making sense of the world by using their bodies, including active exploration of all the senses” (Ministry of Education, 1996, p. 86).

Similar findings from studies conducted by Gilroy (2005) and Lee and Boyle (2003) are presented by Kuzminsky (2008), who investigated the use of IWBs for visual art learning in an American Kindergarten classroom. She researched her own planning and teaching practice to incorporate an IWB in teaching visual art history, and for developing visual thinking strategies in children. Through an eight-week unit relating reading and understanding artworks to reading and understanding ideas and information presented in books, “students compared stories in artworks to stories in children’s literature” (Kuzminsky, 2008, p. 18). Kuzminsky (2008) concluded that the IWB had a positive impact on students’ achievement, motivation and interest for “the IWB makes learning more fun … because students are entertained, focus is improved, and subsequently students achievement is positively affected” (p. 98).

A small case study conducted by Coyle, Yañez, and Verdú (2010) analysed the influence of the IWB on the language use of a primary school teacher and a group of native and non-native speaker students in an English language immersion classroom. The research reported that IWBs have the potential to successfully impact on the quality of classroom interaction (Coyle et al., 2010). It was further reported by Coyle et al. (2010) that IWB software programs can help to focus students’ attention on the lesson content, allow students to visualise the processes involved in solving on-screen tasks, make students’ errors more easily identifiable and promote the sharing of knowledge through listening and talking.

Shenton and Pagett (2007) examined the ways in which IWBs are being used in the context of literacy teaching in six primary schools in England. As they drew on the perspectives of both teachers and students, they concluded that, while IWB use appears to have some
general effects (such as supporting a more cross-curricular approach to literacy and raising the level of student engagement), the use of IWBs is not identical in all classrooms. Discrepancies in relation to IWB use were evident within the classrooms studied and were in accordance with the teachers’ technical expertise and experience. Shenton and Pagett (2007) reported that the teachers generally viewed the IWB as a new item in their teaching toolkit, rather than something that might change and/or support their teaching methodology. Further, they reported that although IWBs can potentially offer a multimodal approach to teaching literacy, the potential for IWBs is more obvious in subjects other than literacy.

As IWB technology is relatively new to the educational context, research on the use of IWBs in K–2 literacy classrooms and their contribution to K–2 teachers literacy-based pedagogical practices is limited. To the author’s knowledge, there is no in-depth research on IWB use in connection with K–2 literacy-based pedagogical practices, especially Australian-based research. Thus, this inquiry contributes to the limited research in this area.

2.7 Conclusion
The previously described literature reflects great interest in IWB technology and its role within classroom teaching and learning contexts. Governments around the globe have demonstrated investment in and promotion of IWB technology. However, while those governments (in particular, the NSW government) are keen to promote IWB technology, it remains uncertain whether such investment and adoption of IWB technology is being converted into valuable and sustainable practice, specifically in relation to literacy-based pedagogical practice.

Because of the influence the IWB has over the classroom environment and unlike other individual forms of technology, IWBs (with the convergence of a broad range of technologies), clearly have the power to have a major impact on teachers’ literacy pedagogy in primary school classrooms. What appears evident from the reviewed literature is that there is indeed a need for further research into the changing nature of teachers’
pedagogy as they begin to embed IWB technology within their classroom contexts, in order to ensure appropriate and optimal literacy-based pedagogical practices.

The literature calls for further investigation into the use of IWB technology within educational contexts. Specifically, the continuation of IWB-based research in relation to best practice and an understanding of where their pedagogical benefits are utmost and essential if IWBs are to be successful within classroom-based teaching and learning experiences. Moreover, to endeavour to make proper use of the power provided to education by IWB technology, further examination into teachers’ use of such interactive technology within their implementation of literacy-based learning experiences, is deemed necessary. It is this disparity that prompts this inquiry.
CHAPTER THREE – CONCEPTUAL FRAMEWORK
3.1 INTRODUCTION

This inquiry draws on Activity Theory (Engeström, 1996) as the conceptual framework to explore and analyse the ways that K–2 teachers use interactive whiteboards (IWBs) in connection with their literacy-based pedagogical practices.

This chapter firstly presents an overview of Activity Theory, including a detailed description of how Activity Theory has been applied to the inquiry. Activity is discussed as a unit of analysis and is connected to the study. Empirical research on Activity Theory, and past research using Activity Theory as the conceptual framework, is lastly reviewed.

3.2 AN OVERVIEW OF ACTIVITY THEORY

A conceptual framework provides the researcher with a lens, or an amalgamation of lenses, to view the phenomenon under investigation. Anfara and Mertz (2006) assert that the conceptual framework “influences the way the researcher approaches the study and pervades almost all aspects of the study” (Anfara & Mertz, 2006, p. 189). Further, it focuses the way in which the study is conducted and, consequently, the questions posed, data collection and data analysis are all influenced and affected by the conceptual framework (Anfara & Mertz, 2006). This inquiry draws on the socio-cultural approach to learning and Activity Theory (Engeström, 1999; Vygotsky, 1978) as its conceptual framework. The lens of Activity Theory “can provide insights into change in teachers’ practices … when a new technological tool becomes part of their teaching activity” (Murphy & Rodriguez-Manzanares, 2008, p. 445). This framework enables the researcher to consider and analyse technologies (IWB) as a tool, which mediates the teaching and learning process as being embedded in multiple layers of its social and cultural contexts, that is, classroom, school and broader relationship contexts (Jonassen, 2002).

Originating from the work of German philosophers Kant, Hegel, Marx and Engles, as well as the writings of Russian cultural-historical psychologists Vygotsky, Leontiev and Luria (Engeström, 1999), the basic concept of Activity Theory is that culturally created signs or tools mediate all human activities. Yamagata-Lynch and Haudenschild (2009) explain that
it is through external interactions with these signs or tools that the internal mental state of the individual is transformed. Moreover, and from an Activity Theory point of view, “people are embedded in a socio-cultural context and their behaviour cannot be understood independently of it … they are not just surrounded by the context of their activities but actively interact with it and change it” (Verenikina, 2001, p. 23).

Activity Theory provides a systematic means of describing and analysing artefact-based interactions within a social context (Parks, 2000). Potentially, Activity Theory “affords a holistic description of an activity system in terms of its basic components and interrelations” (Karasavvidis, 2009, p. 438). The interacting components in an activity system include subject, tools, object, outcome, division of labour, community and rules (see Figure 3.1), and interest can be in relation to the differences within these components as well as among these components (Jonassen, 2002; Karasavvidis, 2009). Lim and Hang (2003) conducted an Activity Theory guided study of the integration of technology in schools. They demonstrated that a focus on activity systems (beyond those of individual classrooms) is required for an aim of effective integration of technology to occur (Lim & Hang, 2003). Activity Theory approach calls for a wider focus than “the day to day classroom activity of teachers” but also “the institutional departmental or school wide level, where the collaboration of teachers and others might result in the transformation of activity” (Murphy & Rodriguez-Manzanares, 2008, p. 445).

Today, Activity Theory is universally recognised as a multidisciplinary research approach (Chaiiklin, Hedegaard, & Jensen, 1999), which is becoming progressively oriented toward the study of work and technologies (Blin & Munro, 2008; Karasavvidis, 2009). Kaptelinin and Nardi (2006) assert that, as a conceptual framework, Activity Theory enables the research “to bridge the gap between motivation and action … [and] … provides a coherent account for processes at various levels of acting in the world” (p. 62). Further, it is acknowledged that, as a framework, Activity Theory is drawn on to design technology-rich learning environments (e.g., Blin, 2004; Jonassen & Land, 2000), enhance evaluation practices of learning technologies (e.g., Scanlon & Issroff, 2005), or comprehend the “variability in adoption patterns when it comes to the activities and purposes for which
information and communication technology (ICT) is being used” (Kirkup & Kirkwood, 2005, p. 186). Activity Theory has also been acknowledged to assist in understanding and providing insight into the changes made by technology within educational contexts (Bellamy, 1996). More specifically, insight into how a technological tool (such as an IWB) can alter and/or affect teachers’ pedagogical practices can be examined through the adoption of an Activity Theory framework.

3.2.1 APPLICATION OF ACTIVITY THEORY TO THE INQUIRY

The researcher selected Activity Theory in order to examine the role IWBs assume when integrated by K–2 teachers into literacy-based pedagogical practices. As Nardi (1996) considers Activity Theory as being a descriptive theory (rather than a predictive theory), the effectiveness of Activity Theory within this investigation is dependent on the researcher being fully aware and able to explicate what tool the K–2 teachers use (IWB), why the K–2 teachers choose to draw on this tool, and how this tool is incorporated and applied by the teachers to achieve the pedagogical objectives of their teaching. Connections between Activity Theory and the inquiry’s purpose, and consequent justifications as to why Activity Theory is considered the most suitable approach for this particular inquiry, are exemplified in subsequent sections.

In considering the affordances and constraints IWB technology has on literacy teachers’ pedagogical practices, the researcher particularly draws on Engeström’s model of activity system (Engeström, 1996). Within Activity Theory is the activity system, which is considered the main component of analysis, and is defined as “object oriented, collective, and culturally mediated human activity” (Engeström & Miettinen, 1999, p. 19). The model of activity system (Engeström, 1996) has been connected to this inquiry and represented diagrammatically in Figure 3.1.
**Tools**
- Interactive Whiteboard (IWB)

**Additional Classroom Tools**
- Curriculum Content and Lesson Materials
- Classroom Discourse and Communication
- Classroom Management
- Assessment
- Teaching Functions

**K–2 Teacher**
Teacher’s Beliefs and Practices about Literacy Teaching and Learning

**Classroom Regulations & Conventions**
- Expected Student Behaviour
- Cooperative and Collaborative Learning
- The Construction of Knowledge
- The Implicit and Explicit Beliefs of Teaching and Learning

**The Reality of IWB use**
- IWB Policies and Perceived Demands of IWB use
- Accessibility and Maintenance
- Support, Training and Professional Development

**Division of Labour**
The Division of Power and Responsibility between the Subject (Teacher) and Community (Students, other teachers, school administration)

**Community**

**Wider School Community**
- Students (in the classrooms under investigation)
- Other Teachers in the School
- IT (Information Technology Staff)
- Administration Staff
- Executives

**Outcome**

**Figure 3.1.** Activity Theory model in connection to the inquiry (adapted from Engeström, 1996)
The key elements of Engeström’s model of activity system (Engeström, 1996) are further discussed in relation to the inquiry. It is important to note that this is a generic description of a teacher’s activity in relation to the use of IWB, however, individual activity profiles may be different when considering individual teachers in particular educational settings.

In the activity system model, the subject of the activity will be a K–2 teacher and an assumed object of the teacher’s activity is considered to be ‘delivering a quality teaching literacy lesson using IWB technology’. The subject’s (individual K–2 teacher) actions and operations during literacy-based learning experiences with an IWB is a critical component of the inquiry and further analysis of specific cases will allow for adjusting this diagram to represent the individual difference for each participant teacher. The subject exists in a community comprising of other individuals and sub-groups that share the same general object, and the relations between the subject and community are mediated by the community’s collection of mediating tools and rules. In this inquiry, the community refers to the wider school community, such as the students in the classrooms under investigation, other teachers in the school, IT staff, administration staff, executives (i.e., principal) and parents/caregivers. The activities of each of the subjects involved in the inquiry (each of the three K–2 teachers operating in different contexts) will also be analysed using Leontiev’s three-level structure, activity–action–operations, to address the dynamic nature of an individual activity (Leontiev, 1978). Activity identification and analysis is discussed in detail in the following chapter of this thesis (Chapter Four).

The tools through which the subject interacts are dependent on the object in the activity system, and it is this dependency that shapes the subject’s interpretation of the tools. Further, in an aim to meet the object of the activity, the subject and the community are constantly altering the tools used within the activity. The tools that will be used by the subjects within the inquiry include IWB, curriculum content, lesson materials, classroom discourse and communication, classroom management, assessment and teaching functions. The interactive technological tool, IWB, is the central tool under investigation, in relation to the use of IWB within literacy-based pedagogical practices. How the IWB is incorporated within literacy-based learning experiences and whether the IWB tool has become the object in the classroom, are two focal questions the
researcher will continue to consider throughout the entirety of the investigation – teachers may just be interested in using the tool by itself, causing the lesson objectives to become lost. The subject’s actions are focused on the object of the activity, causing the object to be “moulded and transformed into outcomes with the help of physical and symbolic external and internal tools (mediating instruments and signs)” (Engeström, 1993, p. 67). Paying particular attention to teachers’ pedagogical practices with the incorporation of the tool (IWB) and, further, examining the affordances of such tool within teachers’ literacy-based pedagogical practices (as opposed to examining the tool itself and what it has to offer), is identified within this inquiry as the object. The object of the activity is continuously being modified and “it manifests itself in different forms for different participants and at different moments of the activity” (Hasu & Engeström, 2000, p. 64). Thus, it is the object, not the tool that is the main focus and the motivating factor of this inquiry.

Within the activity system, rules are “the explicit and implicit regulations, norms and conventions that constrain actions and interactions within the activity system” (Engeström, 1993, p. 67). Rules are continuously negotiated and reorganised, and it is the subject, as opposed to the subject abiding by fixed rules, which does this. In this inquiry the rules are classified as classroom regulations and conventions (expected student behaviour, cooperative and collaborative learning), as well as the reality of IWB use such as school IWB policies and regulations, perceived demands, the regulations of maintenance, accessibility, support and training/professional development. It is within the activity system that there is also a division of labour. With the “continuously negotiated distribution of tasks, powers, and responsibilities among the participants of the activity system” (Cole & Engeström, 1993, p. 7), the division of labour is recurrently being altered and improved by both the subject and the community. Within this inquiry, the division of labour refers to the division of power and responsibility between the teacher (the subject) and the students (the community) during IWB experiences and interactions (i.e., who dominates the experience or is there joint possession of the experience etc.). The outcome is “the consequences that the subject faces because of his/her actions driven by the object. These outcomes can encourage or hinder the subject’s participation in future activities” (Yamagata-Lynch & Haudenschild, 2009, p. 508). In this case, the outcome of the activity system would be improved (or not improved) teaching and learning with IWB, specifically in relation to
literacy-based teaching and learning experiences within these K–2 classrooms. Thus, the IWB would be seen as a tool to support and assist teachers’ pedagogical practices in the delivery of literacy-based learning experiences.

To enable the researcher to present recommendations for pedagogically appropriate IWB use, analysis of possible contradictions within the elements of an activity as well as between the elements of the activity (Engeström, 1996) will occur. Thus, “Activity Theory provides a framework for understanding the dynamic and cyclical relationship of application and evaluation,” as the K–2 teacher (the subject) uses an IWB (a tool) to improve literacy-based teaching and learning (the outcome) (Kervin et al., 2010, p. 6). It is used as a framework for this particular inquiry to provide a systematic method of inquiry for studying IWB integration in NSW public schools. Further, the researcher’s choice of Activity Theory as an analytical device aims to provide a holistic and systematic view of human engagement, in this case, in the implementation of IWBs within pedagogical practices.

Similarities can be drawn between the Activity Theory model and Technological Pedagogical Content Knowledge (TPCK) model (Koehler & Mishra, 2009), as they emphasise the importance of the use of technologies in relation to pedagogy and content knowledge. Specifically, technological knowledge can be seen as a tool of achieving content and pedagogy related goals. However, Activity Theory model provides further insights into multiple layers of social content, which ultimately affects the integration of technology in the classroom. Additionally, Activity Theory model provides an integrative link which allows to interpret the inter-relationship between technologies and pedagogies as a tool – goal reliance (Engeström, 1996).

By embracing an activity-conceptual approach to the inquiry, the researcher will be able to document and describe the activity systems across a number of K–2 classrooms in NSW public schools with the integral contextual understanding of how influential these key elements are on IWB integration within K–2 literacy-based learning experiences. The adoption of Activity Theory will assist to identify the conceptual ideas, principles and philosophical assumptions underpinning the inquiry. Consequently, the researcher will not only be able to understand the various processes within and between activity systems, but will also be able to construct pedagogical models and approaches of IWB
integration for schools, based on these understandings. This understanding is particularly critical to educational research where the object of this inquiry is not simply knowledge but, instead, usable knowledge.

3.2.2 Activity as a Unit of Analysis

Although activities are broken down into analytical components (such as subject, tool and object), “[i]n activity theory the unit of analysis is an activity” (Nardi, 1996, p. 73), and permits the use and investigation into understanding individual actions in relation to their goals, tools, and social and cultural contexts. It is only when the viewing of the larger activity takes place that individual actions are understandable. Thus, as we cannot study one component of a system, and must consider the whole activity as the unit of analysis, Activity Theory has been deemed the most-appropriate conceptual framework for the inquiry, as all components of an activity system are interdependent in formulating the idea of what constitutes an effective IWB use within K–2 literacy teaching and learning. Specifically, the use of the IWB as a tool to achieve the teacher’s pedagogical goal becomes an integral part of this definition (Dixon & Verenikina, 2013).

The activity system model (see Figure 3.1) was utilised for interpretations and discussions of each teacher’s activities and the associated movement(s) (reported in Chapter Five) to represent the individual activity systems of three teachers. Further, the activity systems model (see Figure 3.1) was used to assist in the interpretation and discussion of the teacher’s (subject) goal for the literacy experience (object) and how the IWB (tool) was used to achieve this. The students in the classroom (community) and the interactions they and the teachers had with the IWB, and at what times (division of labour), were also considered. Drawing upon Activity Theory as the conceptual framework for the inquiry provided the researcher with a lens to view the primary teachers’ literacy-based pedagogical practices and important insights into how, and for what purposes, IWB technology was incorporated within these.
3.3 SOME APPLICATIONS OF ACTIVITY THEORY

Many researchers (e.g., Blin & Munro, 2008; Hu & Webb, 2009; Lim & Hang, 2003; Sweeney, 2010; Verenikina, Wrona, Jones, & Kervin, 2010; Waycott, Jones, & Scanlon, 2005; Zevenbergen & Lerman, 2007) have conducted studies on ICT in educational settings, drawing upon Activity Theory. Such studies provide evidence that Activity Theory is appropriate for qualitative research on the use of technology within educational contexts. Presented below is a discussion of studies in relation to Activity Theory and technology use within educational contexts. As the discussion progresses, the limited studies in relation to Activity Theory and IWB use within primary school settings are presented.

Waycott et al. (2005) used Activity Theory “to analyse the ways that distance part-time learners and mobile workers adapted and appropriated mobile devices for their activities and in turn how their use of these new tools changed the ways that they carried out their learning or their work” (p. 107). A case study approach enabled the presentation of the use of personal digital assistants in three diverse contexts. These were distance learners accessing and using e-books (instead of books and computers), mobile workers in the energy industry accessing information while out of the office, and the use of personal digital assistants in an art gallery (i.e., used as multimedia tour guides). Justifications for choosing Activity Theory as an analysis tool included “the emphasis activity theory places on tools, including computer artefacts, as mediators of activity” as well as enabling the “analysis of an interactive dynamic processes of users or learners and their tools [personal digital assistants]” (Waycott et al., 2005, p. 107). The use of Activity Theory as the inquiry’s conceptual framework allowed analysis of data to focus:

on the extent to which the personal digital assistants supported or constrained the user’s activities … how using the personal digital assistant fitted – or not – with other tools that were used for the activity … [and] the participants themselves – e.g., their personal histories and contexts. (Waycott et al., 2005, p. 127)
Thus, the research confirmed that Activity Theory, as a framework for analysing data, provides a means for examining human activity, and appropriately organising and presenting such information in case study form.

From the perspective of Activity Theory, Hu and Webb (2009) investigated the integration of ICT into higher education in China. Seven teachers and their ICT pedagogy were under investigation. Hu and Webb (2009) used Activity Theory “as an analytical tool to investigate the relationships and to identify contradictions in their teaching systems that could lead to teachers’ implementation of a student-centred ICT pedagogy” (p. 143). Findings from Hu and Webb’s (2009) study acknowledged that the critical factor for transformation in teachers’ implementation of a student-centred ICT pedagogy, “lay in the conflict between the deep-rooted teacher-centred pedagogy in the educational system and the student-centred pedagogy that accompanied the introduction of ICT” (p. 143). Further, it is noted that such ‘conflict’ needs to be acknowledged and understood by teachers, curriculum developers and policy makers, in order to change teacher-centred pedagogy, thus creating more effective teaching and learning environments.

Through the lens of Activity Theory, Blin and Munro (2008) investigated the transformation of teaching practices in an Irish university setting, following the institution-wide implementation of a virtual learning environment. It was noted that the main interaction lecturers experience with the virtual learning environment was uploading content, with face-to-face delivery being replicated online, with little disruption or transformation of existing teaching practices taking place (Blin & Munro, 2008). A low uptake of a broad range of activity types offered by the virtual learning environment system was another finding noted, and such instances were reasoned by Blin and Munro (2008) as the lecturers’ lack of knowledge and familiarity with advanced functionalities. Overall, Blin and Munro’s (2008) findings indicated that there was a lack of transformation of teaching practices with the lecturers’ use of the virtual learning environment within classroom practices. They concluded that to bring about the transformational change in teaching practices, along with teacher training, more “radical transformations of the overall social and cultural context of the university teaching practices are … required” (Blin & Munro, 2008, p. 489).
A study conducted by Lim and Hang (2003) examined how Activity Theory is used to analyse the ICT, particularly IWB, integration processes (from both the pedagogical and socio-cultural perspectives) within Singaporean primary school classrooms. Their study explored the internal and external contradictions of an activity system, noting that internal contradictions (i.e., the active learning opportunities provided by IWB technology), were not utilised and the non-curriculum focus in the use of ICT learning packages hindered the effective integration of ICT in the classrooms. External contradictions between activity systems were explored and it was found that the introduction of ICT within classrooms required teachers to creatively interact with the technology and “shape its use through the organisation of activities to support and be supported by its opportunities” (Lim & Hang, 2003, p. 62). However, Lim and Hang (2003) further noted that many opportunities offered by ICT in classrooms would not be exploited “as long as the bottom line (object) hinged on examination result” (p. 62). Thus, ICT is more likely to be effectively integrated within classrooms when teachers exploit the opportunities offered by ICT in assisting students to become lifelong learners, as opposed to the object of “improving examination results” (Lim & Hang, 2003, p. 62).

Zevenbergen and Lerman (2007) studied IWB use in UK middle school mathematics classrooms through an Activity Theory lens. When theorising the tensions in the use and uptake of IWBs to support mathematics learning, Zevenbergen and Lerman (2007) note tension between the IWB and the pre-prepared teaching resources. Further, through such analysis, they state that teachers’ use of pre-prepared IWB lesson materials are resulting in a reduced chance that “teachers will deviate in response to pupils’ needs and indeed might notice pupils’ needs less frequently through the possibility to increase the pacing of mathematics lessons” (p. 861). Such instances are resulting in teachers being lured by the IWBs technologically impressive features to gain students’ attention and thus, “can lead to it being used to close down further the possibility of rich communications and interactions in the classroom” (Zevenbergen & Lerman, 2007, p. 861).

Research on teachers’ IWB use within primary contexts, particularly in relation to literacy practices, and from an Activity Theory perspective, is limited. A qualitative study conducted by Sweeney (2010) used Activity Theory to investigate seven teachers’
IWB use in one primary school in Australia. The NSW Quality Teaching Framework (NSW DET, 2006) was drawn upon to support the seven teachers’ professional development in an aim to improve their pedagogical practices. Data collection procedures included interviews and observations, with the data collected drawn upon from an Activity Theory perspective to gain a more holistic approach when recognising and reporting tensions “about the uptake and effective use of IWBs across the curriculum” (Sweeney, 2010, p. 1). Activity Theory was further used to focus “attention on the processes by which the use of IWBs shape and are shaped by their context” (Sweeney, 2010, p. 6). The findings revealed that the adoption of Activity Theory as a conceptual framework for the study helped describe the tensions between elements within activity system as the teachers transformed (in an aim for improvement) their pedagogical practices. Further, the findings for the:

study described how these tensions were unique to individuals and the school context, and influenced by teachers’ experiences, pedagogical beliefs, their participation in professional development activities, level of technological and pedagogical competence, teaching role and willingness to reflect on and improve their practice. (Sweeney, 2010, p. 6)

A study conducted by Verenikina et al. (2010) explored the integration of the IWB in an Australian primary school classroom and how such interactive technology (IWB) mediates literacy teaching from an Activity Theory perspective. Based on a single teacher case, the study presented findings suggesting that “technology alone is not the remedy to a quality education system rather that technology is useful relative to its need in achieving a learning outcome” (Verenikina et al., 2010, p. 2613). Further, it was noted that it was the adoption of Activity Theory that allowed the researchers “to holistically explore the different factors that influence the use of technology as a tool within literacy teaching activity system” (Verenikina et al., 2010, p. 2613).

Although research into IWB use within primary classroom contexts, through the lens of Activity Theory, is limited, such research in educational contexts supports the adoption of Activity Theory for research within classroom contexts.
3.4 **Conclusion**

The current literature clearly demonstrates that Activity Theory is a useful conceptual framework for this study. It provides a systematic method of inquiry for studying three primary teachers’ use of IWB technology in their K–2 literacy classrooms. By adopting this conceptual approach, the explanation and reporting of activity systems across the three teachers and their classrooms was possible. Such an approach allows us to understand the various processes within and between activity systems and, further, allows us to construct pedagogical models and approaches of IWB integration for teachers and their schools, based on such understandings.
CHAPTER FOUR – METHODOLOGY
4.1 INTRODUCTION

This chapter describes the methodology used to examine the ways that primary teachers (K–2) use interactive whiteboards (IWBs) in connection with their literacy-based pedagogical practices.

Within this chapter, the inquiry’s research questions are firstly presented. The inquiry’s qualitative research design is then examined, followed by a discussion of case study design. A detailed discussion on the locus of the inquiry, including ethical procedures and participants is then presented. The three stages of data collection are outlined, including description and critical discussion of data collection procedures. A rationale for data collection methods in connection with each of the inquiry’s research questions is presented. An examination of the data collection techniques selected and implemented within the inquiry are then analysed and discussed, providing rationale for their necessity and purpose within the inquiry. In the final section of this chapter the credibility of data are discussed, prior to a clear explanation of how teacher activities were identified and analysed in accordance with Activity Theory, the conceptual framework for the inquiry, being presented.

4.2 RESEARCH QUESTIONS

The purpose of this inquiry is to examine, using Activity Theory as a conceptual frame, the ways that primary teachers (K–2) use IWBs in connection with their literacy-based pedagogical practices. To enable this, the following research questions were posed:

How do primary teachers (K–2) use interactive whiteboards in connection with their literacy-based pedagogical practices?

- How are teachers’ use of interactive whiteboard technology supported within their whole-school and professional contexts?
- How are interactive whiteboards incorporated within the pedagogical design and delivery of literacy learning experiences?
- What affordances does interactive whiteboard technology offer for literacy teaching and learning?
4.3 RESEARCH DESIGN

This inquiry employed a qualitative research approach, with the incorporation of case study design (Yin, 2003). This approach was identified as appropriate to meet the purpose of this inquiry, through the employment of a range of different methods of data collection (semi-structured interviews, observations, audio and visual recordings, the collection of artefacts and semi-structured discussions). The research took place within the three teacher participants’ natural work environments (their classroom), as it aimed to understand and interpret the ‘problem’ from the teachers’ perspectives. Thus, this qualitative research paradigm permitted the construction of a “complex and encompassing perspective” (Creswell, 2003, p. 182) of how K–2 teachers use IWBs in connection with their pedagogical practices.

4.3.1 CASE STUDY APPROACH

Case study design is used in many fields, including areas of medicine, psychology, business and law (Berg, 2001), and it has an extensive history in educational research (Burns, 1994). Creswell (2002) defines case study as “an in-depth exploration of a bounded system (e.g., an activity, event, process or individuals) based on extensive data collection” (p. 485). Case study, as a methodology, is proposed by Creswell (2002) if the predicament to be studied “relates to developing an in-depth understanding of a ‘case’ or bounded system” and if the intention is to comprehend “an event, activity, process, or one or more individuals” (p. 496).

In qualitative research, it is important to reflect on the researcher’s postionality as it can affect the ways that research is approached (Denscombe, 2003, Mertens, 2005). To address this issue it is necessary to clearly state the lens through which the researcher investigates the phenomena such as the use of the IWBs in literacy teaching. This study adopted a systematic approach through the lens of activity theory which underpins all the steps of data gathering and interpretation. Activity theory, discussed in detail in chapter three, provides a clear focus to the semi-structured interviews, the collection of artefacts, observations and semi-structured discussions (discussed in relevant sections below) in relation to the aim of the study - to explore a variety of ways that the IWB technology is used as a tool to support the teacher’s literacy pedagogy. Activity driven approach to the inquiry allowed the researcher to document, describe and discuss the
activity systems and the inter-relatedness of its components for each subject as a case and across the cases. Such approach provided a clear and transparent focus for the data collection and analysis both to the researcher and to the participants.

This inquiry utilised a case study research design. The employment of a case study research approach enabled the researcher to collect “close-up and detailed observations of the natural world” (Yin, 2003, p. 14) on each of the three teacher participant’s use of IWB technology within their classroom literacy-based learning experiences. The gathering of such information within each participant’s natural classroom environment “permitted the researcher to effectively understand how it operates or functions” (Berg, 2001, p. 225). With the intention of responding to the research questions and in the process provide a thick description of the ways that primary K–2 teachers use IWBs in connection with their literacy-based pedagogical practices, case study design was selected (Guba & Lincoln, 1989).

Throughout this inquiry, case study design enabled the researcher to explore “a contemporary phenomenon within its real-life context … when the boundaries between phenomenon and context are not clearly evident … in which multiple sources of evidence are used” (Yin, 1984, p. 23). More specifically, the implementation of a case study approach within this inquiry enabled the researcher to gain in-depth knowledge and understandings about each participant’s previous teaching experiences, their literacy-based pedagogical practices and their IWB use within their natural educational settings, that is K–2 classrooms (Burns, 1997; Yin, 2003). Thus, with its ability to focus on a singular distinctive ‘case’ or ‘entry’ (Bouma, 2000), the adoption of a case study research approach extracted “extremely rich, detailed, and in-depth information” (Berg, 2001, p. 225) permitting the researcher to focus on and gain in-depth information on three selected participants as individual cases were formed. The utilisation of several data collection techniques, such as semi-structured interviews, observations, audio and visual recordings, the collection of artefacts and semi-structured discussions, along with the continuous links made between and among data throughout the entirety of the data collection stages, allowed the researcher to constantly make judgements about the significance of the data collected. Consequently, this assisted the researcher to gather the necessary thick, rich data (Yin, 2003) required to generate a understanding of K–2
teachers’ IWB use in connection with their literacy-based pedagogical practices (Burns, 2000).

It is believed that the case study approach is the strategy of preference when ‘how,’ ‘who,’ ‘why’ or ‘what’ questions are being asked, when the researcher has minimal control over events or when the focus is on a contemporary phenomenon within a real-life context (Burns, 1997; Yin, 1984). Through the inclusion of ‘how’, ‘who’, ‘why’ or ‘what’ research questions, this inquiry focuses on comprehending complex contemporary social phenomena, such as the adoption of IWB technology, as it allows the researcher to retain the holistic and meaningful characteristics of real-life events, such as K–2 literacy-based teaching and learning experiences, during the research process (Burns, 1997; Yin, 2003).

Further, the case study design enabled the researcher to explore and examine each individual participant’s contextual conditions. These contextual conditions, such as the previous experiences of individual participants, should be examined carefully, as they are highly pertinent to the research and have the potential to influence the inquiry (Yin, 2003). The case study approach not only allowed the researcher to gain in-depth knowledge and understandings about each participant but, further, provided increased understanding of specific enablers and inhibitors that impacted upon the ways that they use the IWB and how their pedagogical practices are supported and developed through the implementation of this type of interactive technology, within their execution of literacy-based lessons.

Although limitations commonly associated with case study design are that typically cases are not generalisable, as they do not offer numerical representation, the three individual case studies examined in this inquiry were analysed for insights both within each case as well as across cases (Merriam, 1998). Yin (2003) identifies that multiple cases may be chosen to duplicate insights that are found within individual cases or even to denote divergent circumstances. Furthermore, despite whether the purpose is duplicated or divergent, “multiple case studies are considered more compelling, and the overall study is therefore regarded as more robust” (Yin, 2003, p. 46). Participants for this inquiry were selected based on their similarities (i.e., met the same participant selection criteria – teachers identified by Department of Education and Training
personnel, teach a K–2 class full time, are competent and confident IWB users, have an IWB in their classroom, etc.). Because of this, similar cases are presented. Having more than one case of the same kind verifies that multiple cases in case study research reinforce findings and “can strengthen the external validity of the results” (Yin, 1994, cited in Mertens, 1998, p. 184). Thus, the ability to scrutinise the cases in depth (both individually as well as combined) provided clear rationale for the methodological choice.

Issues and limitations related to the trustworthiness, credibility and validity of the research and data gathered from the research need to be considered while conducting case study research. Burns (1997) identifies the issue of greatest concern is the position of human subjectivity when selecting evidence to support or disprove, or when choosing a particular explanation for the evidence found. Mertens (2005) states that it is the researcher who decides which questions to ask, what they are to observe and what they are to record, while considerable interest should be focused on “who the researcher is and what values, assumptions, beliefs, or bias he or she brings to the study” (p. 247). This inquiry investigated how three K–2 teachers incorporate an IWB during their literacy-based pedagogical practices. Case study methodology enabled the researcher to explore the teachers’ experiences while also gaining in-depth knowledge and understandings about each participant, including each individual participant’s contextual conditions (Yin, 2003) and how they (K–2 teacher participants) are incorporating IWB technology within their literacy-based learning experiences.

Although the limitations of a case study design were considered while selecting the case study approach, the ability to pay particular attention to a single specific group (K–2 teachers), the consideration of contextual conditions (such as the participants’ previous teaching experiences and the degree in which they utilise an IWB), and the ability to examine the cases in depth provided clear rationale for the methodological choice.
4.4 **Locus of the Inquiry**

4.4.1 **Ethical Procedures**

Ethics is a fundamental constituent of this type of research, as the wellbeing of participants is central to the inquiry and the researchers are guests in their lives (Christians, 2000; Guba & Lincoln, 1994; Stake, 2000). All ethical considerations, related to this particular inquiry, are now discussed.

Prior to the commencement of data collection, an ethics application was submitted to the Human Ethics Committee at the University of Wollongong. The Human Ethics Committee at the University of Wollongong granted ethical approval for the commencement of this inquiry on Tuesday the fifth of January 2010 (Ethics Application Number: HE09/385). The ethics application was then submitted to The Department of Education and Training for approval to conduct research in public primary schools, statewide. The Department of Education and Training ethics application is referred to the State Education Research Approvals Process (SERAP), and such departmental approval from the Department of Education and Training is needed in order for researchers from external agencies (for example, the University of Wollongong) to conduct research in NSW government schools. At this point, it is important to note that only teachers were under investigation (i.e., not students). Ethical approval for the commencement of this inquiry was granted by SERAP on Friday the ninth of April 2010 (SERAP Number: 2009155). Both ethics applications (the UOW Human Ethics application and SERAP) delineated the purpose of the inquiry, the proposed anonymity of the participants as well as the privacy and discretion of the data collected. This ethical approval process ensured that issues of integrity, such as those of accurately representing data and avoidance of error as well as issues of confidentiality, informed consent, dependent relationships and equity are addressed, and further ensured that appropriate research procedures were observed. Participants were recruited through professional networks and appropriate consent was obtained from these networks before any information was disclosed.
4.4.1.1 Informed Consent

Prior to the commencement of data collection, the researcher communicated information, in writing and as an ‘information sheet’ on the project and specifically in relation to the inquiry’s purpose and structure as well as participant rights and confidentiality. A copy of the teacher information sheet can be found in Appendix A. Each participant was provided with information about the purpose and procedures of the inquiry and all gave informed, written consent to participate. A copy of the teacher consent form can be found in Appendix B. The information sheet and consent form outlined the inquiry’s objectives and procedures to the participants as well as advised the participants of their rights to participate (i.e., their participation in the research is voluntary and that they have the option to ask questions or withdraw from the inquiry at any time). All participants were assured that participation/non-participation would in no way affect their relationship with the researcher, their school/institution or their professional status at the University of Wollongong. All participants were also informed of their freedom to withdraw from the inquiry at any time, with withdrawal being free from penalty or prejudice. As participation in the research was voluntary, no tangible reward was offered (i.e., as an incentive for participating in the research).

4.4.1.2 Confidentiality and Storing Data

Appropriate steps were taken to ensure confidentiality of the data collected and the secure storage of all raw data materials (i.e., audio/visual recordings, transcripts, etc.). As it is imperative that data were stored securely (Christians, 2000), electronically generated data, such as interview transcripts, were stored in a password-protected computer belonging to the University of Wollongong, while all print-based and raw data collected for this research project was securely stored in a locked filing cabinet at the University of Wollongong. In order to maintain the confidentiality of all raw data collected and until all identifying features (i.e., names, places of employment etc.) had been removed from the raw data, it was solely the researcher that had access to this filing cabinet. Thus, the raw data collected for this inquiry was only accessible to the researcher of the inquiry. All participants’ names (and any other personal information, such as places of residence, employment, etc.) have been altered; either replaced with pseudonyms or discarded (if irrelevant to the research) from the initial stages of this
research, in order to protect participants’ identity. Informed consent was requested from all participants and confidentiality was assured.

4.4.2 PARTICIPANTS

4.4.2.1 Participant Recruitment Process

The participants for the inquiry were three primary school teachers who were employed full time in NSW public schools in K–2 classrooms and who had access to and use of an IWB during literacy-based learning experiences on a close to daily basis. Figure 4.1 presents a diagrammatic representation of the participant recruitment process for this inquiry.
4.4.2.1 Researcher: Contacted Ten NSW Regional Directors

Once the SERAP application for this particular inquiry had been approved, NSW Department of Education and Training regional directors were approached. Within the
NSW Department of Education and Training jurisdiction, there are ten regions, with one regional director allocated to each. The ten regions identified by the Department of Education and Training in NSW are: Hunter/Central Coast, Illawarra and South East, New England, North Coast, Northern Sydney, Riverina, South Western Sydney, Sydney, Western NSW, Western Sydney. Each of the regional directors was initially contacted via phone, with an introductory email sent to accompany the phone conversation. The email assisted in providing the regional director with further information (such as ethical approval, information about the researcher, information about the inquiry and what the researcher was asking of them) regarding the inquiry. Following this, all correspondence with the regional directors was done via email or postal mail. A copy of the information email sent to each of the regional directors can be found in Appendix C.

4.4.2.1.2 Regional Directors: Identified Three to Six Schools in each of their Regions in Accordance with the Criteria

Regional directors were asked to identify schools, according to the sampling criteria, that were known to use IWB technology. These were schools known to the regional directors to use IWB technology in a number (more often than not) of classrooms and had access to IWB technology across the grades. It was also anticipated that these schools were recognised in some way (i.e., reputation, reports, awards, research, media coverage, additional funding, etc.) to have a high ratio of IWBs in their school as well were identified (i.e., by reports, awards, research, etc.) to use IWB technology extensively and innovatively.

Seven regional directors responded to the researcher’s email, each identifying three to six schools in their region that satisfied the sampling criteria.

4.4.2.1.3 Researcher: Contacted the Principals at each of these Schools Identified by the Regional Directors

Once the researcher received a response from the regional directors, the researcher then contacted the principal at each of the identified schools and had a conversation with each of the principals. In total, there were 27 schools identified. The researcher
contacted each of the principals to enquire about and identify a practitioner engaged in current full-time employment within a K–2 classroom.

4.4.2.1.4 Principals: Identified Teachers that Satisfy the Criteria

Principals were asked to use their professional judgements to identify teachers based on the sampling criteria. Of the 27 schools contacted, 11 principals identified a K–2 teacher that satisfied the sampling criteria.

4.4.2.1.5 Researcher: Contacted the Teachers and ensured that they Satisfied the Sampling Criteria

Once the school principals used their professional judgements to identify the teachers, the researcher contacted the 11 teachers to make sure that they satisfied the following sampling criteria:

- *The grade the teacher participants are currently teaching* – Teacher participants must be currently full-time employed in a K–2 classroom;

- *The use and accessibility of an IWB* – Teacher participants must have access to and use an IWB on a ‘close to’ daily basis (and no less than twice a week) during literacy-based learning experiences;

- *Confidence and competence levels of IWB use* – Teacher participants must present reasonable levels of confidence and competence in relation to IWB use. It was anticipated that recruiting teacher participants who (on a ‘close to’ daily basis) use IWB technology during their literacy-based learning experiences would present reasonable levels of confidence and competence with IWB technology; and,

- *Willing to participate* – The teacher participants must be willing to participate in the inquiry.

Five of the 11 teachers satisfied the sampling criteria for the inquiry and an information package was sent (via email or postal mail) to each potential teacher participant, in an aim to recruit teacher participants necessary for the inquiry. The information package included:

- A letter to the principal (Appendix D);

- Principal information sheet (Appendix E);
• Principal consent form (Appendix F);
• Teacher information sheet (Appendix A);
• Teacher consent form (Appendix B);
• Student information sheet (Appendix G); and,
• Student consent form (Appendix H).

Different modes of communication were used throughout the participant recruitment process and these were dependent on the participants’ location within the state, their commitments outside the research inquiry, their availability as to when and how they could be contacted and their personal choice of preferred mode of communication. It was through these different modes of communication that the researcher was able to cater to the desires of each of the teacher participants, thus enabling the researcher to make plans to enter into the field in the least-disruptive manner possible as well as being mindful of the need to ascertain good rapport with their participants (Creswell, 1998; Mertens, 2005). Through the initiation and implementation of face-to-face, phone and email conversations, the researcher was able to describe to the participants involved in the inquiry the purpose, aims and methods of the research. Through these conversations, the researcher was able to “ease themselves into the field” to develop a sound rapport with the participants, thus creating the foundation for a trusting relationship (Bogdan & Biklen, 1998, p. 121).

**4.4.2.1.6 Three Teacher Participants were Recruited**

From the five teachers contacted, three teachers expressed interest and agreed to participate in the research. All three teachers were employed within three different Department of Education and Training primary schools and regions within the state.

Purposive sampling was successful in recruiting teachers from different geographical areas within the one system of employment, but with the similar focus on the early years of primary school. The selection of cases was based on participant characteristics in connection with developed sampling criteria for the inquiry. The selection and recruitment of participants was also purposeful in that the sample size was relatively small (three teacher participants) because of the depth of information that was sought from each of three teacher participants and their sites (Mertens, 2005). Although it was
not assumed that the participants recruited for this inquiry were equivalent data sources, those selected were all deemed to be information-rich cases (Polkinghorne, 2005).

This inquiry satisfies the two requirements of an adequate qualitative data base that are met by purposive sampling (Polkinghorne, 2005):

- The statewide recruitment approach provided adequate variation in the data to develop a comprehensive structural description of NSW K–2 primary teachers’ use of IWB technology within literacy-based learning experiences; and,
- The case study approach provided intense descriptions of the phenomenon under investigation.

(Polkinghorne, 2005).

Thus, the reason for purposive sampling to be employed within this inquiry was that the inquiry aimed to examine, in-depth, a sample of information-rich cases. It was at this point that three teacher participants were officially recruited.

4.4.2.2 Participant Overview

Table 4.1 provides an overview of the participants (and their school contexts) involved in this inquiry. Pseudonyms have been used to protect participants’ confidentiality.

<table>
<thead>
<tr>
<th>Teacher</th>
<th>Career Position</th>
<th>Years of Teaching Experience</th>
<th>Years of Teaching Experience with IWB Technology</th>
<th>Year Currently Teaching</th>
<th>School Region</th>
<th>Number of Full-Time Teachers at the School</th>
<th>Number of Students Enrolled at the School</th>
<th>Number of IWBs at the School</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gabby</td>
<td>Late</td>
<td>More than 20</td>
<td>5</td>
<td>1/2</td>
<td>Northern Sydney</td>
<td>30</td>
<td>800</td>
<td>32</td>
</tr>
<tr>
<td>Kaitlyn</td>
<td>Mid</td>
<td>9</td>
<td>6</td>
<td>K</td>
<td>Western Sydney</td>
<td>30</td>
<td>640</td>
<td>33</td>
</tr>
<tr>
<td>Declan</td>
<td>Mid</td>
<td>7</td>
<td>1</td>
<td>K</td>
<td>Illawarra and South East</td>
<td>8</td>
<td>230</td>
<td>9</td>
</tr>
</tbody>
</table>

‘Mid’ career indicates five to 15 years teaching experience and ‘late’ career indicates more than 15 years teaching experience.
A total of three teacher participants were recruited across the state of NSW. Such a statewide approach enabled the researcher to identify the teachers responsive to the diversity of IWB use (i.e., rural setting, high ESL student populations, inner city school, IWB use motivated by teacher enthusiasm, IWB use motivated by funding).

4.5 PROCEDURES FOR DATA COLLECTION

4.5.1 METHODS OF DATA COLLECTION
The inquiry included a number of stages with a variety of methods employed in each of the stages (see Figure 4.2). These included semi-structured interviews, the collection of artefacts, observations and semi-structured discussions, all of which allowed the collection of data from a small number of individuals in order to obtain a more detailed account of experiences (Mackenzie & Knipe, 2006). Specific methods of data collection were selected because, combined, they provided the data that the researcher required to produce a complete piece of research (Bell, 1999). Triangulation of data was evident as a means of cross-checking the credibility of the data collected (see Figure 4.3).

Data gathering techniques were selected in close connection with the conceptual framework (Activity Theory) for the inquiry. The interviews, observations and discussions were structured to enable the researcher to investigate a variety of contexts and draw on individual opinions in relation to all components of the activity, including possible contradictions between them (Engeström, 1996).

Burns (1997) suggests that the case study research design is representational of a funnel. He describes:

The start of the study is the wide end – trawling around, scouting for possible places and people who might be the subject or source of data … A choice having been made, a more detailed exploration begins with the chosen case. A focus develops and data collection narrows down. (Burns, 1997, p. 369)
Figure 4.2 presents a model of the inquiry and reflects the funnel notion identified by Burns (1997) and indicates the stages of data collection involved in this research investigation (Figure 4.2).

Stage One: Preparing for the Field (Prior to Entering into the Field)

- **Step One**: Semi-structured Interviews with School Principals & Teacher Participants
- **Step Two**: Collection & Analysis of School & Teacher Artefacts

Stage Two: The Field

- **Step One**: Observation of Teacher Participants using the Interactive Whiteboard
- **Step Two**: Collection & Analysis of Teacher Participant Artefacts
- **Step Three**: Semi-structured Discussion with Teacher Participants

This stage was repeated four times with each of the three teacher participants

Stage Three: After Entering the Field

- **Step One**: Semi-structured Interviews with Teacher Participants

*Figure 4.2. Stages of data collection: The inquiry at a glance*

The methods of data collection involved in this inquiry are further explored and discussed in connection with the aims and purpose of the inquiry.

4.5.1.1 *Semi-structured Interviews*

Within a qualitative paradigm, interviewing is recognised as integral as it has the capacity to provide rich accounts of the contexts within which the participant operates. Fontana and Frey (2000) suggest that an interview is a ‘practical production’ within such a paradigm whereby the interviewer and participant move together past the
‘what’s’ of the interview to the ‘how’s’. As this inquiry seeks to understand the practical application of IWB technology and its pedagogically appropriate use within literacy teaching and learning experiences, this is particularly fitting.

Semi-structured interviews took place during the first and third stages of the inquiry’s data collection. Interviews were conducted at mutually convenient times and places for the principal and researcher as well as the teacher and researcher. Locations where semi-structured interviews were conducted included school classrooms, participant staff rooms and offices at their schools. It was assumed by the researcher that allowing the principals and participants to select locations for the inquiry to be conducted in that these environments and settings would be comfortable for the principals and participants and help to create an atmosphere that was non-threatening, which, in turn, would place the principals and participants at ease.

To recognise and comprehend the viewpoints of others, Lincoln and Guba (1985) describe interviews as being powerful in capturing the constructions, reconstructions and projections associated with individual participant’s experiences and beliefs. Within this inquiry, although the initial task for the interviewer was to create an atmosphere that would put the respondent at ease, the interviewer also had the responsibility to keep the respondent’s attention focused on the task and progress the interview smoothly. Through the researcher’s familiarisation with the questions and their sequence, the researcher was able to conduct these initial semi-structured interviews like a ‘guided conversation’ by asking the questions in a conversational tone, and without constantly pausing to find what question is coming next, thus assisting with the flow of dialogue (Yin, 2003). Semi-structured interviews that took place within the inquiry are discussed in connection with the aims and purpose of the inquiry.

Prior to entering the field, semi-structured interviews with each school principal and each teacher participant were conducted (stage one, Figure 4.2). Such interviews took place prior to any other forms of data collection, and were conducted within the four-month designated data collection timeframe (23 July 2010 - 02 September 2010).

Semi-structured interviews with principals and teacher participants were initially used to build a rapport and gain knowledge and information about each participant’s school
and background, and therefore ‘get to know’ their participants by gaining insight into each participant’s thoughts, feelings, personal characteristics and background experiences (Leydens, Moskal, & Pavelich, 2004; Mertens, 2005). In both the interviews (with the principal and with the teacher participant), the researcher asked simple, direct questions, thus allowing the researcher to obtain factual and valid responses (Ary, Jacobs, & Razavieh, 1996). Interview questions were constructed prior to the interviews and the principal interview questions focused on school demographics and IWB use within the school, while the teacher participant interview focused on teaching experiences, professional development, literacy practices, IWB competency and the use of IWB technology within their literacy-based teaching practices. The information enabled the researcher to gain insights into each participant’s background knowledge and experiences, as well as attain critical information about each participant’s levels of confidence, knowledge and expertise with the incorporation of an IWB within their teaching practices (in particular, literacy-based teaching practices). This collection of demographic data allowed the researcher to “generalise the findings to a population that the sample is intended to represent” (Gall, Borg, & Gall, 1996, p. 289). Furthermore, Wiersma (1995) believes that background or demographic information about the participant is “important in that it identifies the individual in terms of classifying variables for the analysis” (p. 176). A copy of the principal interview protocol can be found in Appendix I, and a copy of the teacher participant interview protocol can be found in Appendix J.

In the final semi-structured interview (stage three, Figure 4.2), the researcher gained further insights into each participant’s interactions with, and perceptions of, IWB technology use in connection with literacy-based learning experiences. Semi-structured interviews were conducted individually with each teacher participant in this final stage of data collection, and interview times were arranged mutually between the researcher and individual participants. They were conducted over a six-week period, commencing on 20 September 2010 and concluding on 28 October 2010. Specific times when final interviews were conducted with each teacher participant can be found in Appendices K and L. The interviews were conducted at the same locations as each participant’s initial interview (stage one, Figure 4.2). This enabled the researcher to assemble descriptive data from each of the participants’ point of view, thus allowing for the development of insights into each participant’s personal opinions, which may not be achieved through
other forms of data collection (Bogdan & Biklen, 1998; Hannabuss, 1996; Leydens et al., 2004). The purpose of the incorporation of an interview in the final stage of the data collection was for the researcher to not only gain understanding of the participants’ perspectives of the incorporation of IWBs within their teaching practices, but to also validate the data previously obtained.

One of the most important aspects of a semi-structured interview is its flexibility (Ary et al., 1996) and interviews are a “good way of finding out what the situation looks like from other points of view” (Elliott, 1991, p. 80). More specifically, semi-structured interviews are useful as they allow the opportunity for both the interviewer and participant to pursue an interesting lead that spontaneously occurs during the interview (Elliott, 1991). When conducting an interview, it is the interviewer who has the opportunity to observe the participant and the total situation in which they respond, repeat questions or seek clarification, as well as press for additional information from the respondent when a response seems incomplete or not entirely relevant (Ary et al., 1996). The semi-structured interview questions were tailored to each individual participant and were based upon the data collected through semi-structured interviews (stage one, Figure 4.2), observations (stage two, Figure 4.2), the collection of artefacts (stage two, Figure 4.2) and semi-structured discussions (stage two, Figure 4.2). Copies of transcripts from interviews and observations were issued to the teacher participants via email, prior to the conduction of this final semi-structured interview, thus allowing the researcher to seek clarification and/or gain further information on the data previously collected (Gall et al., 1996).

In order to record the responses accurately and completely (Ary, Jacobs, & Razavieh, 2002), the researcher recorded participants’ responses by using field notes and audio recordings, which were later transcribed. This enabled the researcher to transcribe the collected data accurately, having the ability to play and re-play the entirety of each interview. The researcher maintained the accuracy of this form of data collection through the use of member checking, where the researcher emailed transcriptions to individual participants. This enabled the researcher to ‘double-check’ and confirm details of the data collected and subsequent researcher interpretation.
Interview responses were recorded as field notes, as well as recorded using an audio device. Audio recording was implemented as a form of member checking, thus enabling an accurate and complete depiction of the interview (Ary et al., 1996). The use of audio recordings also ensured that, when transcribing, the participants’ own words of explanation and expression are used rather than that of the researchers (Yin, 2003).

This stage (stage three) also included ‘member checking’, as it aimed to ‘check’ that the information gained from these other procedures was accurate. This protocol provided the researcher with a tool for refocusing responses, as well as ensuring some degree of comparability between the three participants during data analysis (Flick, 2002; Hannabuss, 1996).

Constant interaction throughout the course of the data collection stages facilitated a relationship of trust between the researcher and individual participants. This relationship formed a foundation for the creation of a relaxed environment, as the participants appeared to feel comfortable sharing their personal experiences and beliefs. Subsequent to each participant’s interview the researcher analysed the data in order to determine whether it confirmed, contradicted or complicated the data previously collected (Leydens et al., 2004).

4.5.1.2 Artefacts

Artefacts are written or recorded material that are not prepared in response to a request by a researcher (Lincoln & Guba, 1985), but are prepared for a specific personal or professional purpose (Burns, 1994). Artefacts include lesson plans, teaching programs, syllabus documents, classroom lesson creations and work samples (Mertler, 2006). Artefacts can be used to retain the context of the setting, confirm information from other sources, and provide additional information that may not be accessible through observation or interview (Guba & Lincoln, 1981; Patton, 2002; Yin, 2003). Such information may include the language, values and attitudes used/held by each participant (Creswell, 2003; Torres & Magolda, 2002). As “people develop documents as they engage in particular contexts”, the participants in this inquiry constructed documentation as they utilised the IWB within the literacy-based learning experiences (Kervin, Vialle, Herrington, & Okely, 2006, p. 92). The collection and analysis of
school and teacher artefacts took place within the first and second stages of data collection.

Within the first stage of data collection, school and teacher artefacts were collected (stage one, Figure 4.2). School artefacts included school demographics. IWB policies were also intended to have been collected, however, no school had a current policy on IWB use, or technology in general, for that matter. Teacher artefacts included teacher programs and teaching philosophies (especially in relation to literacy and technology). These artefacts were collected and analysed by the researcher, thus allowing the researcher to have an in-depth understanding of both the whole school and the individual teacher’s approach to teaching using IWB technology.

Within the second stage of data collection, artefacts such as NSW Board of Studies syllabus documents (BoS, 1998), programs and/or lesson plans, lesson materials such as worksheets (used within the lesson), student work samples, IWB lesson creations (soft copies saved as data files and hard copies as print outs), audio recordings and any additional materials that were needed for the lesson were collected and analysed. All forms of artefacts collected were acknowledged as valuable sources of data (Lancy, 1993), as they (the artefacts) do not merely include ‘typical paper products’ and can take the form of technological devices, documents, samples of work and so forth (Burns, 2000; Mertens, 2005). Throughout this inquiry, artefacts were collected by being downloaded, printed and/or saved as data files and collected by/mailed to the researcher and, thus, utilised as a significant form of data collection. The compilation of such artefacts provided the researcher with the necessary background to the situation and insights into the dynamics of everyday functioning (Bogdan & Biklen, 1998; Gottschalk, Kluckhohn, & Angell, 1945; Mertens, 2005).

Along with the participants’ IWB data files, audio and visual recordings were also forms of artefacts that were gathered and analysed throughout the course of this inquiry. Audio and visual recordings were captured as the participants interacted with the IWB during the literacy learning experiences. These were taken to capture and further document any discussions that took place amongst participants and the students (as well as the researcher). Audio recordings were also generated when individual participants
were being interviewed about their experiences with the integration of IWB technology in literacy lessons. The audio recording device was perceived as a highly valuable artefact within the inquiry, as it was “used in an uncomplicated and unobtrusive manner” (Bogdan & Biklen, 1998, p. 102).

The collection and analysis of artefacts were valuable to this inquiry as they were able to yield data “far beyond that which could be directly observed in the limited time of a site visit” (Yin, 2003, p. 96). Accordingly, artefacts collected during this inquiry supplied the researcher with valuable data that was relatively simple to retrieve yet, at the same time, provided insights into individual participants’ views on IWB technology and literacy-based pedagogical practices.

Once the collection of all artefacts was complete, the data was analysed and triangulated with participants’ demographical information (stage one, Figure 4.2) and field notes (stage two, Figure 4.2), which assisted the researcher in devising questions for the next step (step three) in stage two of the research.

4.5.1.3 Observations

Classroom observations of teacher participants using the IWB during their literacy-based learning experiences were conducted within stage two of data collection (see Figure 4.2). Four observations were conducted in each of the three K–2 teachers classrooms. The observations were one to two hours in length each, arranged for mutually convenient times and were dependent on a number of considerations, including: the participant’s commitments, the participant’s use of IWB within literacy-based learning experiences, the researcher’s commitments and the location of the participant within the state. The location of the participant also determined the frequency of the observations. For example, if the participant school was located close to the researcher, then the researcher was able to visit on a weekly basis, however, if the participant school was located hours away from the researcher, then the observations needed to be conducted over a shorter and more-condensed timeframe, that is, over a one-week period.

Each of the three participants’ observational periods are described and illustrated below.
4.5.1.3.1 Gabby’s Observational Periods

Four observational periods, over a one-week period, took place in Gabby’s classroom, capturing the day’s literacy session. Table 4.2 outlines details of these sessions.

Table 4.2

<table>
<thead>
<tr>
<th>Observation</th>
<th>Date</th>
<th>Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Monday 30 August 2010</td>
<td>9:15 – 11:15</td>
</tr>
<tr>
<td>2</td>
<td>Tuesday 31 August 2010</td>
<td>9:15 – 9:45</td>
</tr>
<tr>
<td></td>
<td></td>
<td>10:19 – 11:15</td>
</tr>
<tr>
<td>3</td>
<td>Wednesday 01 September 2010</td>
<td>9:15 – 10:30</td>
</tr>
<tr>
<td>4</td>
<td>Thursday 02 September 2010</td>
<td>9:15 – 10:40</td>
</tr>
</tbody>
</table>

In total, Gabby was observed for six hours and six minutes. It was during this time that a number of activities were observed as Gabby conducted literacy-based teaching and learning experiences in connection with her IWB use.

4.5.1.3.2 Kaitlyn’s Observational Periods

Four observational periods, over a one-week period, took place in Kaitlyn’s classroom, capturing the day’s literacy session. Table 4.3 outlines details of these sessions.

Table 4.3

<table>
<thead>
<tr>
<th>Observation</th>
<th>Date</th>
<th>Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Monday 26 July 2010</td>
<td>8:45 – 10:45</td>
</tr>
<tr>
<td>2</td>
<td>Tuesday 27 July 2010</td>
<td>8:45 – 10:45</td>
</tr>
<tr>
<td>3</td>
<td>Wednesday 28 July 2010</td>
<td>8:45 – 10:45</td>
</tr>
<tr>
<td>4</td>
<td>Thursday 29 July 2010</td>
<td>8:45 – 10:45</td>
</tr>
</tbody>
</table>

In total, Kaitlyn was observed for eight hours. It was during this time that a number of activities were observed as Kaitlyn conducted literacy-based teaching and learning experiences in connection with her IWB use.
4.5.1.3.3 Declan’s Observational Periods

Four observational periods, over a two-week period, took place in Declan’s classroom, capturing the day’s literacy session. Table 4.4 outlines details of these sessions.

Table 4.4
Declan’s observed literacy sessions

<table>
<thead>
<tr>
<th>Observation</th>
<th>Date</th>
<th>Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Monday 09 August 2010</td>
<td>9:35 – 11:15</td>
</tr>
<tr>
<td>2</td>
<td>Tuesday 10 August 2010</td>
<td>9:15 – 11:15</td>
</tr>
<tr>
<td>3</td>
<td>Wednesday 18 August 2010</td>
<td>9:35 – 11:15</td>
</tr>
<tr>
<td>4</td>
<td>Thursday 19 August 2010</td>
<td>9:30 – 11:15</td>
</tr>
</tbody>
</table>

In total, Declan was observed for seven hours and five minutes. It was during this time that a number of activities were observed as Declan conducted literacy-based teaching and learning experiences in connection with his IWB use.

The observations took place in naturalistic situations (Leydens et al., 2004), without the use of pre-determined categories of measurement or response (Adler & Adler, 1994). However, to ensure that the data collected during observations was focused, all observations were closely guided by an observation protocol, developed from an Activity Theory perspective. Observational field notes were recorded during all observations in order to “represent the researcher’s best effort to objectively record the details of what has occurred in the field” (Bogdan & Biklen, 1998, p. 121). In addition, observational field notes were also taken using a semi-structured approach, drawing upon Creswell’s (2003) notion of focusing the researcher on elements of interest to the inquiry. As opposed to using a highly structured format, which depends on the researcher making low-inference observations (Knight, 2002), a flexible observational protocol for recording data was established (Creswell, 2003). A four-column table was created to organise the field notes. The first column was for general questions and things that the researcher should constantly focus on, the second for the time, the third for the actual field notes and the fourth for subsequent preliminary data interpretation. The template for field notes can be found in Appendix M.
During the periods of observation, participants were observed as well as audio and video-recorded. The inclusion of audio and visual devices assisted in the credibility of the observational data collected.

Qualitative research “tends to place great emphasis on the role of the researcher in the construction of data” (Denscombe, 2003, p. 234). Throughout the observational periods encompassed within this inquiry, the researcher became the instrument of data collection. It was during these data collection periods that the researcher was removed from participation for the majority of the time as she observed and took notes in an unobtrusive manner.

Non-participant observation, passive participation, moderate participation, active participation and complete participation are five different types of research participation, which Spradley (1980) categorises as data collection methods. In this inquiry, the researcher’s participation during data collection could be classified as non-participant observation (Spradley, 1980), for the researchers involvement was at “the lowest level” as the researcher did not have any part to play in the natural setting (Mertens, 2005, p. 382).

Adler and Adler (1994) define three most common qualitative researcher observational roles: peripheral-member-research, active-member-researcher and complete-member-researcher. In this inquiry the position of the researcher can be categorised as a peripheral-member-researcher, as she observed and interacted closely with the participants to establish an insider’s perspective, without participating in the activity itself. Thus, within the data collection phase of this inquiry, the researcher observed and interacted with the teachers during their implementation of literacy learning experiences with an IWB in a capacity that reflects both that of ‘passive participation’ (Spradley, 1980) and ‘peripheral-member-researcher’ (Adler & Adler, 1994).

However, there are limitations with observations. For example, it is thought by many qualitative researchers that the situation in which observations take place can never be entirely captured (e.g., Bogdan & Biklen, 1998; Flick, 1998). It is also recognised that all phenomena cannot be observed in all situations and comprehensive knowledge processes and patterns of thinking are not accessible in observations (Flick, 2002). It is
further recognised that the descriptions recorded (during observational periods) only represent the researcher’s selection, that is what the researcher wishes to observe and record (Mertens, 2005) along with their own personal judgements. During this inquiry, the qualitative researcher endeavoured to accurately depict the setting in order to minimise these limitations (Bogdan & Biklen, 1998). Teacher participants were observed individually in their own classroom environment and each teacher participant was interviewed individually, according to questions devised for that participant. This was done with the aim of creating a more-concentrated and, optimally, more-accurate approach. To further respond to such limitations, different data collection methods such as observations, audio and visual recordings, semi-structured discussions, collection of artefacts and semi-structured interviews were implemented to triangulate the data collected (see Figure 4.3) and, further, to develop the rich description necessary for qualitative methodology.

Time spent on conducting observations as well as interpreting and analysing observational data means that observation, as a data collection method, can be quite time consuming (Blaxter, Hughes, & Tight, 2003). For this inquiry, extensive periods of time were not proposed for the collection of observational data, as the purpose for observations in this inquiry were to capture how the teachers incorporated IWB technology within the delivery of literacy experiences, with this observational data being analysed and triangulated with other data collected.

It was through observations that, first hand, the researcher was able to develop a concrete picture of the people, places and settings where the research was conducted (Leydens et al., 2004), thus, supporting the construction of rich and detailed descriptions.

4.5.1.4 Semi-structured Discussions

A semi-structured discussion with teacher participants was conducted after each of the observations. They could also be labelled ‘guided conversations’ (Yin, 2003) whereby the interviewer (the researcher) provided a series of structured questions, observed the participant and the total situation in which they responded, repeated questions or sought
clarification, as well as being flexible by probing for additional information from the respondent (Ary et al., 2002; Gall et al., 1996).

The purpose of the semi-structured discussions after each observational period was to gain further insights into the literacy lessons (with the use of IWB technology) just observed. These discussions also allowed the researcher the time to ask additional questions and make clarifications based on their observations and any artefacts collected, thus strengthening the accuracy of the observational data (and the preliminary analysis of this data) collected. Therefore, the discussions allowed the researcher to gain deeper understanding of the teachers’ general perceptions of incorporating IWB technology within their literacy-based learning experiences. The semi-structured discussions were audio-recorded.

During the semi-structured discussions, the questions asked were fashioned by the experiences and knowledge of the teacher participants to encourage retrospective inspection/recall (Flick, 2002; Mertens, 2005). The term refers to the use of materials, artefacts and corresponding questions supported the teacher participants in recalling a specific situation during the discussion process. For example, retrospective inspection throughout this step (within stage two) of data collection was enhanced by the IWB made available as support material, which enabled the participants/respondents to make use of it as they were questioned, in order to assist their responses. Additionally, artefacts such as IWB lesson creations (soft and/or hard copies), student work samples, lesson plans, teacher programs and NSW Board of Studies (BoS, 1998) syllabus documents were made available, to assist teacher participants’ responses and enable the researcher to gain accurate and detailed responses.

### 4.5.1.5 Stimulated Recall

Specifically, retrospective inspection was encouraged through access to and the use of the IWB during the semi-structured discussions (stage two, Figure 4.2) and the final semi-structured interview (stage three, Figure 4.2) where the questions asked were fashioned by the experiences and knowledge of the participants (Flick, 2002; Mertens, 1998).
The use of materials and corresponding questions supported interviewees in recalling a specific situation during the interview process. Throughout the semi-structured discussions and final semi-structured interview, the IWB was made available as support material, and the interviewees/respondents were able to make use of it as they were interviewed, to talk through their thought processes and, furthermore, assist their responses to the questions presented by the researcher. Additional material was also used throughout the interview process and included teacher transcripts and the artefacts collected by the researcher. This material was used as another source to encourage and support further discussion.

4.5.2 RATIONALE FOR DATA COLLECTION METHODS

Tables 4.7, 4.8 and 4.9 explain the purpose and methods of collecting data in response to each of the framing questions for this inquiry.

- How are teachers’ use of IWB technology supported within the whole-school and professional contexts?

Table 4.5

Rationale for data collection methods (1)

<table>
<thead>
<tr>
<th>Data Collection Method</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Semi-structured interview with school principals</td>
<td>• To build a rapport and gain demographic knowledge and information of the school and the wider school context.</td>
</tr>
<tr>
<td></td>
<td>• To gain an understanding of the history of IWB use within the school.</td>
</tr>
<tr>
<td></td>
<td>• To gain an understanding of IWB technology use within the whole-school context.</td>
</tr>
<tr>
<td></td>
<td>• To gain an understanding of the professional development offered to teachers in relation to the use of IWB technology.</td>
</tr>
<tr>
<td>Initial semi-structured interview with teacher participants</td>
<td>• To gain demographic knowledge and information of individual teachers’ IWB history and role with IWB technology within the school.</td>
</tr>
<tr>
<td></td>
<td>• To gain an understanding of the professional development offered and experienced by individual teachers in relation to the use of IWB technology.</td>
</tr>
<tr>
<td>Collection of school and teacher artefacts</td>
<td>• To gain knowledge and understanding of the policies and procedures put in place by the school in relation to literacy teaching and IWB technological practices.</td>
</tr>
<tr>
<td></td>
<td>• To gain knowledge and understanding of how these IWB policies and procedures reflect individual teachers’ literacy practices.</td>
</tr>
</tbody>
</table>
• How are IWBs incorporated within the pedagogical design and delivery of literacy learning experiences?

Table 4.6
Rationale for data collection methods (2)

<table>
<thead>
<tr>
<th>Data Collection Method</th>
<th>Purpose</th>
</tr>
</thead>
</table>
| Initial semi-structured interview with teacher participants | • To build a rapport and gain knowledge and information about each participant’s teaching experiences, their class and their school.  
• To gain an understanding of the teachers’ IWB experiences and use.  
• To gain an understanding of how the teachers design IWB experiences, particularly literacy experiences.  
• To gain knowledge and understanding of the teachers’ use of IWB technology within literacy practices. |
| Collection of school and teacher artefacts                  | • To gain demographical information and knowledge of the school and teacher participant.  
• To gain an in-depth understanding of the whole-school approach to literacy teaching using IWB technology.  
• To gain an in-depth understanding of the individual teacher’s approach to teaching using IWB technology.  
• To collect lesson documentation and student work samples. These were used to support and further analyse other data collected (i.e., observational periods).  
• To gain further knowledge and understanding into the dynamics of everyday functioning (Bogdan & Biklen, 1998; Gottschalk et al., 1945; Mertens, 2005). |
| Observations                                                | • To gain, first hand, knowledge and understanding of how the teachers used and interacted with the IWB during the delivery of literacy experiences.  
• To develop a concrete picture of the teacher and their classroom setting where the use of the IWB technology during literacy experiences took place (Leydens et al., 2004). |
| Discussions                                                 | • To gain further insights into the use and delivery of IWB technology within the literacy experiences observed.  
• To clarify and strengthen the accuracy of the observational data.  
• To gain deeper understanding of the teachers’ general perceptions of the incorporation of IWB technology within their literacy practices. |
| Final semi-structured interview                             | • To gain further insights into each participant’s interactions with, and perceptions of, IWB technology use in connection with literacy-based practices.  
• To validate the data previously obtained in relation to each teacher’s incorporation of IWB technology within the design and delivery of literacy experiences. |
• What affordances does IWB technology offer for literacy teaching and learning?

Table 4.7
Rationale for data collection methods (3)

<table>
<thead>
<tr>
<th>Data Collection Method</th>
<th>Purpose</th>
</tr>
</thead>
</table>
| Initial semi-structured interview with teacher participants | • To build a rapport and gain knowledge and information about each participant’s teaching experiences.  
• To gain an understanding of the teachers’ literacy expertise.  
• To gain an understanding of the teachers’ IWB experiences and use.  
• To gain an understanding of how the teachers design IWB experiences, particularly literacy experiences.  
• To gain knowledge and understanding of the teachers’ use of IWB technology within literacy practices. |
| Collection of school and teacher artefacts     | • To gain an in-depth understanding of the whole-school approach to literacy teaching using IWB technology.  
• To gain an in-depth understanding of the individual teachers’ approach to teaching using IWB technology.  
• To collect lesson documentation and student work samples. These were used to support and further analyse other data collected (i.e., observational periods).  
• To gain further knowledge and understanding into the dynamics of everyday functioning (Bogdan & Biklen, 1998; Gottschalk et al., 1945; Mertens, 2005). |
| Observations                                   | • To gain, first hand, knowledge and understanding of how the teachers used and interacted with the IWB during the literacy experiences presented.  
• To gain, first hand, knowledge of what IWB affordances teachers were using and incorporating during their literacy experiences and at what times.  
• To develop a concrete picture of the teacher and their classroom setting where the use of IWB technology during literacy experiences took place (Leydens et al., 2004). |
| Discussions                                    | • To gain further insights into the use and affordances of IWB technology within the literacy experiences observed.  
• To clarify and strengthen the accuracy of the observational data.  
• To gain deeper understanding of the teachers’ general perceptions of the affordances of IWB technology and the incorporation of these IWB affordances within their literacy practices. |
| Final semi-structured interview                | • To gain further insights into each participant’s interactions with, and perceptions of, IWB technology use and affordances in connection with literacy-based practices.  
• To validate the data previously obtained in relation to each teacher’s incorporation of IWB technology within literacy experiences presented. |
4.6 Audit Trail

An audit trail is, “used to enhance the dependability of qualitative research” (Ary et al., 2002, p. 480) and the reliability of materials, which document how the inquiry was conducted, is best checked through the process of auditing (Flick, 2002). Materials involved in an audit trail include the raw data gathered in interviews, observations and artefacts. These document not only how the inquiry was conducted, but also document what was done, when it was done and how it was done (Ary et al., 2002). An audit trail allows independent auditors to analyse the inquiry from beginning to end and, furthermore, evaluate the credibility of the findings.

Schwandt and Halpern (1988), cited in Mertens (2005), derived a number of questions that they believed guided an audit for reviewing qualitative investigations. These questions are outlined below:

1. Are findings grounded in the data? (Is sampling appropriate? Are data weighed correctly?)
2. Are inferences logical? (Are analytic strategies applied correctly? Are alternative explanations accounted for?)
3. Is the category structure appropriate?
4. Can inquiry decisions and methodological shifts be justified? (Were sampling decisions linked to working hypotheses?)
5. What is the degree of researcher bias (premature closure, unexplored data in field notes, lack of search for negative cases, feelings of empathy)?
6. What strategies were used for increasing credibility (second readers, feedback to informants, peer review, adequate time in the field)?

(Schwandt & Halpern, 1988, cited in Mertens, 2005, p. 426)

An audit trail was kept during the course of this inquiry, where all interactions that occurred between the researcher and participants were recorded. More precisely, the audit trail outlines the time frame and data collection procedures incorporated within this inquiry. A copy of the inquiry’s audit trail can be found in Appendix L.
4.7 Data Analysis

In qualitative studies, data analysis is an ongoing process as “findings are generated and systematically built as successive pieces of data are gathered” (Mertens, 2005, p. 420). Bogdan and Biklen (1998) acknowledge this perception by explaining that whilst collecting data the researcher can, in fact, commence data analysis. Evidently, the collection and analysis of data were ongoing processes throughout this investigation. During the data collection stages, preliminary data analysis in connection with Activity Theory, the conceptual framework for the inquiry, was undertaken with the intention to further channel this into future collection to build significantly rich data.

During the procedures of data analysis in this inquiry, as well as through the lens of Activity Theory, the researcher was able to methodically explore and arrange the data collected. This enabled the researcher to enhance understandings and provide exposure of their discoveries to others (Ary et al., 2002). Explanations of the analysis practices appropriate to specific collection procedures utilised in this inquiry are further described.

4.7.1 Semi-structured Interviews

During both interviews (step one of stage one, and step one of stage three, of data collection), field notes and digital audio recordings were used to capture the interview data. After scheduled interview periods, these recordings were transcribed into a Microsoft Word document. Although qualitative studies often generate large quantities of information that require sorting and summarising (Bouma, 2000), in this inquiry the transcriptions were condensed into shorter summary sheets, with the major occurrences and quotes being taken from the longer, more-exhaustive text. Each of the three participants were awarded a unique colour and a record was kept as to which colour represented whom. These different colours were used to identify any quotes or significant issues captured across the three individual interview transcripts.

Digital audio recording transcripts were also used for member checking, thus enabling an accurate and complete depiction of the interview to be captured. The researcher maintained the accuracy of this form of data collection by presenting audio-recorded
transcriptions to each individual participant. This enabled the researcher to ‘double-check’ and confirm details of the data collected and subsequent researcher interpretation. Further, the use of audio recordings also ensured that when transcribing, the participants’ own words of explanation and expression are used rather than that of the researchers (Yin, 2003).

4.7.2 ARTEFACTS
Participants’ artefacts such as NSW Board of Studies syllabus documents (BoS, 1998), programs and/or lesson plans, worksheets (used within the lesson), lesson creations on the IWB (soft copies were saved as data files and hard copies were as print outs), digital audio and visual recordings and any additional resources that were needed for the lesson, were collected and preliminary analysed in stage one (step two) and stage two (step two) of data collection.

The researcher prepared the data (gained from the artefacts) for analysis by formatting them in a consistent style. This style included a two-column table layout, whereby all artefacts were placed in the left-hand column and the right-hand column was left for the researcher to document notes as preliminary data analysis was conducted.

Similarly to the interview data, the artefacts were colour coded according to the participant that they belonged to. Emerging themes from each participant’s artefacts were then compared to those emerging themes evident in other data sources, allowing the researcher to determine similarities and differences among the divergent forms of data collection. Further, analysis of artefacts took place in the form of triangulation (see Figure 4.3).

4.7.3 OBSERVATIONS
The data collected from observations (step one in stage two, Figure 4.2) were collected in the form of hand-written field notes and digital audio and visual recordings. Ary et al. (2002) defines field notes constructed during qualitative research as the written records of both observations and conversations. The field notes created in this particular inquiry were transferred into a table in Microsoft Word, with general questions in the first column, the time in the second column, the data in the third column and the preliminary
All semi-structured discussions (step three of stage two, Figure 4.2) were audio-recorded in order to capture the discussion data. The audio recordings were then transcribed with pertinent points underlined and researcher comments indicated with italics. This data was integrated into each of the participant’s observational field notes table, which was constructed in Microsoft Word. The researcher recorded accurate timing as to when discussion occurred during periods of observation. Emerging themes that came from these data were then highlighted and compared with the emergent themes from observational and artefact data. This was to ascertain the similarities and differences among data collection procedures. Transcriptions were then condensed into shorter summary sheets, with the major occurrences and quotes being taken from the longer, more-exhaustive text. Each teacher participant’s discussion data were coded in accordance with the code previously assigned to them.
Subsequent to data being coded and categorised according to the emerging themes within each of the different data collection procedures, emerging themes from the semi-structured interviews, observational data, the collection of artefacts and semi-structured discussions, were further identified and compared. This comparison of data documentation aimed to reveal the similarities and differences within data across the different collection procedures. Through revisiting the data and further analysis of the data, new themes emerged and, thus, new categories were created. It is here that the main themes of the inquiry were established.

It has been warned by Cohen, Manion and Morrison (2007), that the interpretative nature of qualitative research is a continuing threat to the reliability and validity of an inquiry. These issues of credibility are further examined in connection with this inquiry.

4.8 Building Credibility

The notion of credibility pivots around the extent to which research data and the methods for obtaining the data are deemed accurate, honest and on track (Denscombe, 2003). Furthermore, qualitative researchers endeavour to complete the data analysis phase of the inquiry with data that has been construed in a credible and reliable manner (Leydens et al., 2004). A number of research strategies, such as the collection of multiple sources of data, member checking and peer debriefing were employed during this inquiry to ensure the trustworthiness and credibility of the data collected for analysis. Activity identification and analysis were also in close connection to Activity Theory, the conceptual frame for the study. These strategies are further discussed in the subsequent sections.

4.8.1 Multiple Sources of Data

A researcher can produce confidence about the credibility of a qualitative inquiry when multiple sources of data and evidence are gathered and analysed (Cohen et al., 2007). According to Burns (1994), credibility is achieved by examining the “consistency of findings generated by different data collection methods” (p. 273) and by checking interpretations from the same data collection procedure across a number of participants. The use of multiple sources of data collection in qualitative research is traditionally
defined as triangulation and is further explained below (Burns, 1994; Cohen et al., 2007; Denzin & Lincoln, 1998; Lincoln & Guba, 1985).

Triangulation is the powerful process of drawing on multiple data collection strategies and multiple data sources to facilitate the credibility and validity of data and, thus, inform an inquiry’s findings (Leydens et al., 2004). The data were consistently triangulated by, “corroborating evidence from different sources in order to shed light on a theme or perspective” (Creswell, 1998, p. 202), thus, developing the rich description necessary for a qualitative study.

The common technique of triangulation was used to improve the internal validity of the inquiry, as it prevented the researcher from accepting too freely the reliability of initial impressions (Burns, 1994). In this inquiry, the data were triangulated as a means of cross-checking the reliability and credibility of the data collected. The data were also triangulated in order to compare and contrast information gathered from different sources and/or methods, thus providing and ensuring the consistency of evidence across data collection methods (Burns, 1994; Mertens, 2005). Figure 4.3 depicts the triangulation of data within this inquiry.

Figure 4.3. Triangulation of data
It was through the collection and analysis of these data that emergent themes and categories became evident. These emergent themes and categories enabled the researcher to develop the three case studies.

4.8.2 MEMBER CHECKING

Member checks are imperative measures in establishing the credibility of data in an inquiry (Mertens, 2005). Merriam (1998) asserts that checking the researcher’s interpretations with the participant (from whom the data were collected) shields the researcher from bias and from “finding out what he or she expects to find” (p. 202). In this inquiry, member checks with the participants were undertaken to authenticate the developments that were being constructed during data collection and analysis. During the construction and implementation of interview questions, member checking was utilised as the researcher sought clarification and additional explanations from each of the participants in relation to their verbal comments and their non-verbal signals.

Distributing interview transcriptions to participants with the appeal for confirmation of their responses is imperative to the authentication of research (Donahue, 2003; Mertens, 2005). In this inquiry, the researcher emailed transcribed copies of the interviews to each of the three participants with the aim of confirming the accuracy of the researcher’s depiction of the participants’ comments. Whilst there were no concerns raised by any of the participants over the accuracy of the data collected, the member checks proved to be a valuable exercise as they reassured and guaranteed the credibility of the researcher’s collected data.

As part of member checking, “the researcher must verify with the respondent groups the constructions that are developing as a result of data collected and analysed” (Mertens, 2005, p. 255). This notion was also apparent through this inquiry. During the construction of each of the individual case studies, data and analysis were frequently returned to the participant to ensure the ongoing truthfulness of both the data and the researcher’s interpretation of that data.

4.8.3 PEER DEBRIEFING

According to Lincoln and Guba (1985) peer debriefing is “useful in establishing credibility” (p. 308) as it provides opportunities to test emerging hypotheses, further
identify and explore unanswered questions as well as allow the researcher to clear their mind to pay particular attention to the salient information. Throughout the course of the inquiry, peer debriefing was conducted with the researcher and her three research supervisors, who have extensive research and teaching experience and who were able to assist with the review and discussion of the collected data and subsequent analysis (Kervin et al., 2006). Timetabled weekly meetings with the researcher and three supervisors were held to probe for possible pre-dispositions and investigate emerging interpretation of the data obtained (Pedersen & Liu, 2003).

Ary et al. (2002) explain that through the process of peer debriefing, “colleagues or peers are provided with raw data along with the researcher’s interpretation or explanation … and that it is during this time that the reviewers may identify problems in the interpretation and stress the need for additional data” (p. 452). The researcher was conscious of the fact that bias and sources of error are highly significant issues for researchers (Hitchcock & Hughes, 1995) and, therefore, the researcher engaged in the process of peer debriefing subsequent to each of the data collection stages. The researcher incorporated processes of peer debriefing into the inquiry with the intention to assist in the close scrutiny of these issues, therefore facilitating the composition of accurate and unbiased interpretations when analysing and reporting on the data collected.

4.8.4 Activity Identification and Analysis
For meaningful analysis of the teacher participants’ use of the IWB, a literacy teaching activity of the teacher as a subject was chosen as a unit of analysis. This allowed examining the use of the technology in its inextricable relation to the teacher’s pedagogical practice in the context of an authentic setting such as the classroom. The teacher’s literacy teaching activities were identified and analysed according to Leontiev’s (1978) three-level activity structure, where each activity of the teacher as a subject can be carried out by a number of different actions to contribute to its main objective, and each action is carried out by a number of operations. For the purpose of this inquiry each ‘action’ was labelled as ‘movement’ as this term was more meaningful for the teachers in the discussion.
To identify an activity as a unit of analysis, the data collected from semi-structured interviews, semi-structured discussions with the teachers, observations and the NSW Board of Studies: English K–6 Syllabus (BoS, 1998) were used. Only activities that were supported by the use of the IWB were identified and analysed. It was assumed, and further confirmed during semi-structured interviews and discussions, that all the teachers based their pedagogical practices (i.e., programming, lesson preparation and implementation) and structured their literacy teaching episodes around the NSW Board of Studies: English K–6 Syllabus (BoS, 1998). Thus, the activities were identified and labelled based on pedagogical aims of literacy teaching as presented in the syllabus (BoS, 1998) and as observed in each teaching episode. Under each activity a number of corresponding actions (labelled as ‘movements’ in this inquiry) were identified in relation to specific goals that allowed the teachers to achieve the purpose of each activity. Only the movements that were supported by the use of the IWB were further analysed.

Activity headings were closely worded and based on stage-appropriate outcomes in the NSW Board of Studies: K–6 English Syllabus (BoS, 1998) and movements within the activities identified were closely worded and based on the relevant indicators in the NSW Board of Studies: K–6 English Syllabus (BoS, 1998). These were confirmed with the teachers during semi-structured discussions and stimulated recalls to ensure that the researcher correctly identified the intention of the teacher in relation to each literacy outcome.

In the presentation of the findings in subsequent chapters, direct connections to participant data were made through the coding of teachers’ observed activities and movements. An example of participant activity and movement coding is: (G-A1-M2), where the first initial represents the participant (in this example, Gabby), the middle letter and number represents the activity number (in this example, activity one) and the final letter and number represent the movement number (in this example, movement two). Thus, in this example, the coding is referring to the second movement in Gabby’s first activity. Coding may also have multiple movements listed (i.e., G-A1-M2, M3). This meaning that direct reference is made to more than one movement and, in this case, connections to both Gabby’s second and third movements in her first activity are presented. See Chapter Five for examples of teacher activities and movements.
The established activities were analysed from the point of view of how the IWB technology fit within the activity and its movements, and how the use of the IWB as a tool assisted (or otherwise) the teacher as a subject in achieving their pedagogical aims and goals. Additionally, Engeström’s (1996) activity system model was used to analyse the ways that the interactions between the teacher, as the subject of activity, and the students, and between the students (as classroom community) were mediated by the use of the IWB as a tool. Put differently, the pedagogical approaches that were afforded by the use of the IWB, teacher centred, child centred and/or social constructivist, were analysed. The teachers’ activities were also analysed in relation to the whole-school community context such as school policies and regulations of IWB implementation, the resources and professional development opportunities that were made available for teachers, the school community attitudes towards the use of the technology and peer support culture.

4.8.5 Individual Case and Cross-Case Study Analysis
The individual participant cases were examined and analysed for insights both within each case and across the cases. As the participants for the three cases were chosen based on their similarity (teaching in K-2 class in a technology-advanced DEC school and being competent and confident IWB users), in presentation of each case special care was taken in providing a thick description of each component of the activity model and their interconnectedness. Each case was analysed in a similar manner, in relation to personal, classroom and whole school contexts, and their interconnectedness, as well as the relationship between the teacher’s pedagogical goal (activity objects) and the use of the IWB as a tool to achieve this goal. Thus, individual analysis of each case allowed for a holistic presentation of the range of each teacher’s activities in their unique contextual circumstances. Individual case analysis provided a rich understanding of specific enablers and inhibitors that impacted upon the ways that each teacher used the IWB. Individual cases are presented in Chapter Five. The inter-case analysis was conducted in a twofold manner. First, similarities were identified between the cases to build a consistent understanding of the ways that the IWBs were used. Second, the predominant tensions between the components of each teacher’s activities were compared and contrasted and conclusions were drawn to produce a model of the effective use of IWBs in literacy classrooms.
4.9 CONCLUSION

The employment of qualitative data collection methods and analysis assisted to work toward the purpose and intentions of the investigation, that is, the inquiry of the ways that K–2 teachers use IWB technology in connection with their literacy-based pedagogical practices. The case study approach enabled the researcher to collect and obtain descriptive and detailed data, thus allowing investigation into the effective use of IWB technology within K–2 literacy learning experiences, as the experiences of three practitioners (in relation to literacy teaching pedagogical practices and IWB technology) and their connections between IWB technology and actual classroom environments were examined. Such K–2 literacy-based teaching and learning experiences were examined and explored from the perspective of the inquiry’s conceptual framework, Activity Theory (Engeström, 1996).
CHAPTER FIVE – CASE STUDIES
5.1 INTRODUCTION

This chapter presents the data collected from three teacher participants to examine the ways that these K–2 teachers used Interactive Whiteboards (IWBs) in connection with their literacy-based pedagogical practices.

Individual case studies have been developed to capture the perspectives and experiences of the three participants: Gabby, Kaitlyn and Declan. Each of the three cases describe the K–2 teachers’ use of IWBs within their literacy-based teaching and learning experiences. Data used to construct each case included: semi-structured interviews and discussions with principals and teacher participants; researcher observations in teacher participants’ literacy classrooms; and the collection and analysis of school, teacher and student artefacts (see Audit Trail, Appendix L, for coding of participant data sources).

The reporting of each case has been shaped and guided by the central research question:

- How do primary teachers (K–2) use interactive whiteboards in connection with their literacy-based pedagogical practices?

Further, each case addressed the three sub-questions for the inquiry:

- How are teachers’ use of interactive whiteboard technology supported within their whole-school and professional contexts?
- How are interactive whiteboards incorporated within the pedagogical design and delivery of literacy learning experiences?
- What affordances does interactive whiteboard technology offer for literacy teaching and learning?

The cases have been arranged according to the individual participants’ school, their teaching experiences, their classroom and their professional teaching practices. The first section introduces the school in which the teacher was employed at the time of inquiry. Background information about the school setting, demographics of the school and the history of IWB technology within the school are presented. The second section presents a detailed description of the teacher’s expertise and IWB experiences. The third section works to describe the classroom in which the observations took place. Demographic information on the students in the class is presented, with description of the classroom...
layout including position of the IWB. The fourth section of each case details the IWB activities and movements as observed by the researcher. Activities that were supported by the use of the IWB were identified within classroom observational periods (see section 4.8.4) and have been labelled based on pedagogical aims of literacy teaching as presented in the English K–6 Syllabus (BoS, 1998). Under each activity a number of associated actions using the IWB (referred to as ‘movements’ in this inquiry) were identified in relation to specific goals that enabled the teachers to achieve their intended aim in each activity. An interpretive summary follows each identified activity. Activity identification and analysis was in close connection with Activity Theory, the conceptual framework for the inquiry.

A summary of key points of each participant’s whole case is presented in the final section of each case. Connections between the participant’s pedagogical design (i.e., demonstration of literacy knowledge and IWB proficiency) and participant’s delivery of literacy learning experiences (i.e., the IWB as a, focal point, repository and guiding framework) are made. It is also within the latter section of the case summary that tensions between the participant’s IWB use and pedagogical practices and the impact on the nature of interactivity through IWB use are discussed.
GABBY
5.2 **The School**

5.2.1 **Location**
The school is situated in a high socio-economic area on the northern beaches of Sydney (G-II-27.8.10) and is located in the Department of Education and Training’s North Sydney region of NSW.

5.2.2 **Teacher Demographics**
There were 30 full-time classroom teachers at the school, along with one principal and one deputy principal (G-DPI-27.8.10) at the time of inquiry. Mid-to late-career teachers were the average experience level of teachers at the school. Gabby explained, “we have quite a few teachers in their fifties and sixties and we are trying to bring in some younger teachers but the average age would probably be around the late forties early fifties” (G-II-27.8.10).

5.2.3 **Student Demographics**
There were approximately 800 students enrolled at the school at the time of inquiry with between 100 and 120 students per grade (G-DPI-27.8.10). There were 30 classes in the school; 14 of these making up the infant/early years school classes (G-DPI-27.8.10). Of these 14 infant/early years classes, four classes (two Kindergarten/Year One classes and two Year One/Two classes) were composite classes.

5.2.4 **A Brief History of Interactive Whiteboard Technology in the School**
In 2005, through Parent and Community Committee funding, the first four IWBs were installed at the school (G-DPI-27.8.10). A conscious effort was made to distribute them evenly across grades, with two being installed in infant classrooms and two being installed in primary classrooms, and they were allocated in response to teacher interest in IWB technology and the teachers who were willing and prepared to share associated practices using the equipment (G-DPI-27.8.10). It was at this time that the other teachers at the school recognised the potential of IWB technology in the classroom and another four IWBs were installed in 2006, again through Parent and Community Committee funding (G-DPI-27.8.10). In 2007, the school received an $80,000 Federal
government grant. This, combined with further Parent and Community Committee funding, enabled an additional 24 IWBs to be installed during 2007 and 2008. At the end of 2008, every classroom in the school as well as the library and the teacher resource room (which has the video-conferencing/Connected Classrooms IWB) was fully equipped with IWB technology. Thus, there were 32 IWBs in the school at the time of inquiry.

All IWBs installed at the school were SMART boards. This was a conscious decision made by the school leadership and was based on the relationship the school had (and were building) with Electroboard (G-DPI-27.8.10). The relationship between the school and Electroboard is primarily through Gabby who creates IWB lesson materials for Electroboard and delivers IWB professional development sessions for the company (G-II-27.8.10). Electroboard’s website features IWB classroom examples and Notebooks created by Gabby (G-DPI-27.8.10).

The factors contributing to the successful installation and teacher enthusiasm of IWBs within the school is said to include the active Parent and Community Committee and the vision and commitment of the principal (at the time) who committed funding to the installation process (G-DPI-27.8.10). The deputy principal explained:

There were dollars committed to the technology. There were dollars committed to the professional development and learning of teachers. There were dollars committed to buying software that was needed. There were dollars committed to peripherals such as the Centios. There were dollars committed to buying and maintaining of the [IWB] technology. There were dollars committed to further professional development at a higher level and there were dollars committed to having the vision of having one [IWB] in every classroom. (G-DPI-27.8.10)

The deputy principal explained that the adoption of the principal’s vision by the teachers has been seen to create a strong collegial environment. It is this collaboration between teachers, creating a culture of sharing practices, that enables teachers to look into other classrooms and sharing SMART Notebooks, that “support staff in the pursuit of innovative teaching practice using IWB technology” (G-DPI-27.8.10).
Innovative teaching with IWB technology was a priority within the school. The school aims to foster connection between drama and literacy experiences (i.e., storytelling) and pedagogies embracing IWBs have been able to support such experiences (G-DPI-27.8.10). This focus (embedding drama within literacy) has evolved through the ongoing support of an academic partner for a decade (G-DPI-27.8.10).

Further, in terms of teaching and learning with IWB technology, the deputy principal explained that the regional director has identified “the school has been classed as a lighthouse school in NSW over the last few years” as they are recognised for their use with IWB technology throughout both the region and the state (G-DPI-27.8.10).

5.3 The Teacher

5.3.1 Teaching Experience
Gabby has been teaching for over 20 years and has taught in a range of school settings (G-II-27.8.10). Gabby began her teaching career as an English as a Second Language (ESL) teacher at the Japanese centre in Sydney, before moving to teach adults in both Sydney and Queensland (G-II-27.8.10). Gabby has also worked at a number of preschools and primary schools, teaching all grades from prior-to-school age to Year Six (G-II-27.8.10). Gabby gained a full-time position at this primary school in 2001 and, since then, Gabby has taught Kindergarten to Year Two (G-II-27.8.10). Gabby is an experienced teacher.

Gabby is a member of a number of professional associations including the Australian Literacy Educators Association (ALEA) and the Primary English Teaching Association Australia (PETAA) (G-II-27.8.10). Her membership to these associations provided further evidence of both her commitment to the profession and literacy education.

5.3.2 Interactive Whiteboard Experience

5.3.2.1 History of Interactive Whiteboard use
Gabby first used an IWB in her classroom in this school at the end of 2005 and has had one in her classroom ever since (G-II-27.8.10). Gabby attended the weekly 30 minute
IWB professional development sessions conducted by the NSW Department of Education and Training, which took place when the initial IWBs were installed at the school (G-DPI-27.8.10). However, she described these professional development experiences as too slow and it was through trial and error and her ‘have a go’ attitude, that Gabby learnt how to use an IWB (G-II-27.8.10). She explained:

Initially I learnt through trial and error … and I took the time to fiddle with the IWB alone. I conducted research on IWBs, asked staff members questions [based on IWB use], attended a number of SMART Board/Bug user groups and completed a number of free online IWB tutorials. (G-II-27.8.10)

Since 2005, Gabby has been the school’s IWB technology coordinator and has been highly involved with IWB technology in the school, from their initial installation to current use (G-DPI-27.8.10). Gabby has also worked closely with other teachers at the school and SMART, and “her expertise has seen her coordinate and present at conferences both nationally and internationally” (G-DPI-27.8.10). Gabby has only used and interacted with SMART IWBs and Notebook software.

On a self-rated scale with one being ‘poor’ and five being ‘excellent’, Gabby rated her level of expertise with IWB technology as being ‘five – Excellent’. She commented, “In terms of the IWB, I would like to think I have the skills that are excellent. I think … I hope … and I try to use them [her skills] all the time” (G-II-27.8.10). The deputy principal commented on Gabby’s IWB use, “There is no doubt that Gabby is our most outstanding IWB user … she has been invited overseas … she has presented locally at conferences like ALEA, she has worked with the Department of Education and Training and she has gone to the US with them” (G-DPI-27.8.10).

At the time of inquiry, Gabby had been using a SMART IWB in her classroom for five years. She explained, “This is the second time this year that I haven’t had my projector working and you realise how you can’t function without it [the IWB]. Well, that’s how I feel now” (G-II-27.8.10). Although Gabby had a fixed SMART IWB in her classroom, during the time of inquiry a portable projector was used in place of her usual fixed short-throw projector.
5.3.2.2 Interactive Whiteboard Professional Development

Within the school, Gabby has provided many opportunities for IWB professional development for other staff, including creating the ‘Red and White’ club, sharing times before staff meetings, and creating and maintaining an online learning environment (G-II-27.8.10, G-DPI-27.8.10).

The ‘Red and White’ club was created by Gabby and took place after school. The club was based around IWB technology and wine, and was where teachers would voluntarily come, share their IWB experiences and enter into little competitions based on IWB use, while enjoying food and red and white wine. These sharing sessions took place on a monthly basis and prior to each session Gabby advertised what was to be discussed and presented in the up and coming ‘Red and White’ club sharing session. Initially, the club was a success, with between 15–30 teachers attending each session. The deputy principal explained, “it was extremely popular … there was this amazing culture of sharing and it [this club] was very successful … I mean ‘Red and White’ club staff training sessions have been shared and adopted by numerous schools and regions throughout NSW” (G-DPI-27.8.10).

Similar to the ‘Red and White’ club, when the first four IWBs were installed, Gabby offered an IWB sharing time for 15 minutes before the school’s scheduled weekly staff meeting. This sharing time could be anything including, “a Notebook that you developed or a site you have seen” (G-DPI-27.8.10). Due to a gradual lack of teacher attendance and participation a year after the club was established, these sharing times (prior to staff meetings sharing time and the ‘Red and White’ club) have since ceased.

Gabby also created an online sharing environment called, “All Things SMART”. This is a server that the teachers could access and upload/download any IWB resources and, “it’s virtually a dumping ground for anything to do with IWBs” (G-II-27.8.10). Folders were arranged under the title, ‘All Things SMART’ and would include ‘All Things SMART English’, ‘All Things SMART Maths’ etc. This, again, was a voluntary sharing space, which was viewed by the teachers to be “a highly valuable shared online environment” (G-DPI-27.8.10). Literacy resources included within this space are filed in Stages (i.e., Early Stage 1, Stage 1, etc.) within the ‘All Things SMART English’ folder and include literacy-based, teacher-made resources and literacy-based Internet
resources and links. In her role as IWB technology coordinator, Gabby was in a position to maintain this resource for staff.

5.4 The Classroom

5.4.1 Students
At the time of inquiry, Gabby had a composite Year One/Two (Stage 1) class (G-II-27.8.10). There were 25 students in her class: 13 Year One students and 12 Year Two students (G-II-27.8.10). She had the higher performing Year One students and, “a select few are gifted and talented … and the other students are very able and capable” (G-II-27.8.10). Gabby had an even mix of gender in her class, with 12 boys and 13 girls (G-II-27.8.10). The cultural background of the students in the class was equally divided between Australian, European and Asian, all of who were native-English speakers (G-II-27.8.10).

5.4.2 Setting/Layout
The classroom was a demountable, positioned at the southern end of the school grounds. Figure 5.1 presents a diagrammatical representation of Gabby’s classroom setting/layout.
Photographs depicting Gabby’s classroom setting/layout can be found in Appendix N.

5.4.2.1 Position of the Interactive Whiteboard

Gabby had a SMART IWB in her classroom, which was fixed in the centre of the western wall of the classroom. It usually used a short-throw projector, but at the time of inquiry, the short-throw projector was broken and a temporary projector was used in its place (G-II-27.8.10). The temporary projector was located on a table in the middle of the floor space and proved to be an issue because as soon as it moved slightly (i.e., the table was bumped, someone jumped, etc.) the IWB needed to be calibrated (G-FN1-30.8.10, G-FN2-31.8.10, G-FN3-1.9.10, G-FN4-2.9.10). Gabby explained, “I would hardly ever have to calibrate the IWB with my normal projector … I would maybe do it three or four times a year” (G-II-27.8.10).
During the four periods of observation in Gabby’s classroom, Gabby was recorded calibrating the IWB a total of 14 times; three times during the first observation (G-VR1-30.8.10), four times during the second observation (G-VR2-31.8.10), four times during the third observation (G-VR3-1.9.10) and three times during the fourth observation (G-VR4-2.9.10). Because of this temporary projector, shadows on the IWB screen were also an issue (G-FN1-30.8.10, G-FN2-31.8.10, G-FN3-1.9.10, G-FN4-2.9.10). The tall students’ heads cast a shadow on the IWB (while sitting down) in addition to the shadow cast onto the screen from the person using the IWB (G-VR1-30.8.10, G-VR2-31.8.10, G-VR3-1.9.10, G-VR4-2.9.10). Power and Internet cords were also an issue and seen as a trip hazard as they ran from the middle of the room (from the laptop and projector) to the front of the room (G-VR1-30.8.10, G-VR2-31.8.10, G-VR3-1.9.10, G-VR4-2.9.10).

The computer connected to the IWB was a PC laptop computer, funded by the school (G-II-27.8.10). It was permanently located next to the projector (on the table in the middle of the room). Under this table was a printer/scanner, which was connected to the laptop. There were also four PC desktop computers (including a printer), which were positioned along the classroom’s southern wall. The computers and printer were not used during the four classroom observational periods of Gabby’s literacy sessions. Gabby also had a portable easel whiteboard positioned to the left of the IWB, next to her chair. This whiteboard was said to be, “very rarely used”, and it was not used at any time during the four periods of observation (G-II-27.8.10).

5.5 The Activities

Over a one-week period, four periods of observation were conducted in Gabby’s classroom. These were scheduled at times identified by Gabby within the class’s daily literacy session (see Table 4.2). Three pedagogical activities supported by the IWB were identified in the observations by the researcher. An overview of these is presented in Table 5.1.
Table 5.1
Overview of Gabby’s activities

<table>
<thead>
<tr>
<th>Activity</th>
<th>Name of Activity</th>
<th>Movements within the Activity</th>
<th>Observation/Duration</th>
</tr>
</thead>
</table>
| 1        | Drawing on an increasing range of skills and strategies when reading and comprehending a fiction text | • Predicting the topic of the fiction text (13 min)  
• Clarifying the meaning of the fiction text (13 min) | 1 (26 min) |
| 2        | Identifying the ways in which texts differ according to their purpose, audience and subject matter | • Identifying character qualities and characteristics (19 min)  
• Exploring persuasive techniques in oral language (12 min)  
• Identifying critical moments and retelling of a familiar story (25 min) | 1, 4 (56 min) |
| 3        | Spelling         | • Using a variety of strategies to spell familiar words (16 min)  
• Reviewing an independent task (10 min) | 2 (26 min) |

The next sections describe and discuss each of the three activities and their associated movements.

5.5.1 ACTIVITY 1: DRAWING ON AN INCREASING RANGE OF SKILLS AND STRATEGIES WHEN READING AND COMPREHENDING A FICTION TEXT

The teacher’s pedagogical aim in this literacy activity was to engage students in shared reading. To do this, Gabby introduced and discussed a text she had selected, *The Dancing Bear* by Michael Morpurgo (2009) (a short fictional novel published by Harper Collins). More specifically, Gabby wanted her students to draw on an increasing range of skills and strategies when reading and comprehending texts (BoS, 1998). The two researcher-identified IWB movements employed to do this were:

1. Predicting the topic of the fiction text (13 min); and,
2. Clarifying the meaning of the fiction text (13 min).

5.5.1.1 Movement 1 – Predicting the Topic of the Fiction Text

The teacher’s goal in this first movement was for the students to predict the topic of the text (BoS, 1998; G-D1-30.8.10). An overview of the movement’s sequence, and the key phases within, is presented in Figure 5.2.
Prior to reading the text, Gabby showed her students a published copy of the text, *The Dancing Bear*, and briefly orientated the students to the text with an oral explanation. Gabby then used the IWB to present a scanned image of the text’s cover and two typed, teacher-devised questions. The layout of this on the IWB screen is captured in Figure 5.3. The first question worked to engage students’ prior knowledge (‘what do you know about bears?’) and the second question was related to critical moments within the narrative (‘what do you think the book is about?’). On the floor the students worked in pairs for five minutes to make oral predictions about the text from looking only at its front cover. Gabby selected students to share their predictions with the class and she recorded keywords from the students’ responses under the second question on the IWB (in hand-written form) as represented in Figure 5.3.
The pedagogical pattern used to respond to the second question presented on the IWB (i.e., students orally brainstorm in pairs with ideas orally shared and recorded in handwritten form on the IWB screen) was repeated as the first question was responded to on a new IWB screen. Figure 5.4 captured Gabby recording students’ responses to the first question in keyword form.
From this experience, Gabby then navigated to a new IWB screen and wrote ‘critical moment’ (at the top centre of the screen), and then converted it to typed text. The pedagogical pattern used to respond to the two previously described questions presented on the IWB was again evident, as students were asked to predict the critical moments in the text and these were recorded (as illustrated in Figure 5.5).
Gabby saved the IWB lesson materials created during the movement as students positioned themselves at their desks in preparation for an independent writing task.

5.5.1.3 Movement 2 – Clarifying the Meaning of the Fiction Text

The teacher’s goal in this second movement was for students to attain meaning of the text (BoS, 1998; G-D1-30.8.10). An overview of the movement’s sequence, and the key phases within, is presented in Figure 5.6.

![Diagram](image)

**Figure 5.6.** Gabby’s pedagogical sequence in movement two (activity one)

Prior to this movement Gabby had read a section of the selected text to the students. As Gabby re-read this section of the text to the students a blank IWB screen was displayed. Gabby asked the students to think specifically about the setting, and individual students were called upon to illustrate an aspect of the setting.

Seven students participated directly with this experience as they used the IWB pens and their fingers to create a joint illustration of the setting (such as grass, snow-capped mountains, a farmhouse, trees, a river, sheep and hay) on the IWB. Gabby supported these interactions by helping the students manipulate the IWB using affordances such as infinite cloning, enlarging illustrations, selecting pens to use finger as a stylus. Figure 5.7 provides an example of the workflow that emerged during this process, as the student then the teacher (repeated) produced a dioramic response to the task.
This shared, illustrative construction then led to the students being asked to orally describe the setting of the text in pairs, using the jointly constructed picture on the IWB as a stimulus (G-FN1-30.8.10).

5.5.1.2 Interpretative Summary of Activity 1

In both these movements the IWB was used to display the students’ predictions, thoughts and ideas through both written text and illustration.

While the IWB was central to both movements, the students were also provided with opportunity to engage with the physical text, oral reading and paired discussion. Gabby used the IWB to provide visual support to each of these language modes. For example, in movement one the IWB acted as a visual display to support, stimulate and prompt students’ thoughts when making predictions about the text in pairs. The IWB was used to support identified goals of the movements, as the IWB was used to capture the experiences and provide a guiding framework to the literacy lesson, which enabled the teacher and students to navigate between stimulus materials and lesson foci.

The IWB also became a repository where the shared predictions (G-A1-M1) and illustrative efforts (G-A1-M2) of the students were captured. To engage with each of these processes the students interacted with the IWB as they physically used it, offered suggestions or revisited captured work products to support their learning. Both these movements provided examples of students’ active engagement in their learning, supported by the use of the IWB. Movement two showed how students manipulated objects to illustrate their interpretations as they worked toward creating a shared visual representation. Deep level of understanding of the author’s meaning of the text was
stimulated in movement two through the use of another semiotic system, namely drawing. In addition to the visualisation was the oral discussion of the story.

Gabby’s proficient use of the IWB in this activity demonstrated her awareness of the affordances of the tool to support her teaching (e.g., in movement one to display stimulus questions to guide discussion and to record ideas in both written and typed forms, and in movement two to illustrate features of the setting on the IWB through her utilisation of IWB features such as infinite cloning and sizing options) and student learning (e.g., in movement one to provide a visual display and in movement two to create a whole-class joint visual representation). Gabby’s use of the IWB to present ‘print font’ (through the IWB’s immediate tool to convert written text to typed text) gave the appearance of more-acceptable ‘published’ comments in movement one. Gabby’s use of these affordances provided her with data/evidence of student learning and enabled her to participate in the process of students’ co-construction of knowledge about the text.

5.5.2 Activity 2: Identifying the Ways in Which Texts Differ According to Their Purpose, Audience and Subject Matter

The teacher’s pedagogical aim in this literacy activity was to promote expressive features of oral language through identifying the ways in which texts differ according to their purpose, audience and subject matter (BoS, 1998). The three researcher-identified IWB movements employed to do this were:

1. Identifying character qualities and characteristics (19 min);
2. Exploring persuasive techniques in oral language (12 min); and,
3. Identifying critical moments and retelling of a familiar story (25 min).

5.5.2.1 Movement 1 – Identifying Character Qualities and Characteristics

The teacher’s goal in this first movement was for students to identify character qualities and characteristics (BoS, 1998; G-D1-30.8.10) and included opportunities to categorise adjectives (character traits) and writing. An overview of the movement’s sequence, and the key phases within, is presented in Figure 5.8.
Prior to this movement, Gabby had read a section of the selected fiction text (*The Dancing Bear*, by Michael Morpurgo) to the class and led the class through discussion and drama activities focused on the characters in the text.

Gabby was seated to the left of the IWB, facing the students and holding open a published copy of *The Dancing Bear*. The students were positioned on the floor, each with an individual whiteboard (approximately 25 x 20cm in size) and whiteboard pen. The students had drawn three columns on their individual whiteboards that were labelled for each character in the text: Roxanne, Grandfather, Bear. The IWB displayed a pre-prepared teacher-created table of adjectives named ‘Random Word Chooser’, which scanned and randomly selected/highlighted a word every time the ‘select’ button was tapped. Photographs of the classroom layout and the ‘Random Word Chooser’ table on the IWB are presented in Figure 5.9.

*Figure 5.8. Gabby’s pedagogical sequence in movement one (activity two)*
Gabby asked a student closest to the IWB to tap the ‘select’ button on the IWB and the ‘Random Word Chooser’ scanned the words, finally stopping and highlighting a word. A discussion on which character this adjective/trait word belonged to took place before students were invited to record the word in the correct column on their individual whiteboards. The student was directed by Gabby to tap the ‘select’ button another 16 times, with the same pedagogical pattern (i.e., the student tapped the ‘select’ button, the Random Word Chooser scanned and selected/highlighted a word, a discussion between Gabby and the students about which character the selected adjective belonged to and the students’ recording of the word in the correct column on their own whiteboard) occurring. An example of a student’s individual whiteboard has been photographed and presented in Figure 5.10.
Figure 5.10. Student work sample of the identification of character traits

For the duration of the random word chooser activity, Gabby held the published copy of the text (open at the page they were up to), and while she frequently looked at it she did not orally refer to it. Students’ lesson creations on their individual whiteboards were used at a later stage of the day to assist students to independently complete a response writing worksheet.

5.5.2.3 Movement 2 – Exploring Persuasive Techniques in Oral Language

The teacher’s goal in this second movement was for students to explore persuasive techniques in oral language (BoS, 1998; G-D1-30.8.10). An overview of the movement’s sequence, and the key phases within, is presented in Figure 5.11.
Gabby was positioned facing the IWB on a chair behind the students and the IWB projector table. She read part of the published text, *The Dancing Bear*, (by Michael Morpurgo) to the students, who were sitting on the floor, facing both her and the IWB. The IWB displayed a pre-prepared SMART Notebook page, which included two scanned images (one each of the two main characters from the text) each with a speech bubble above their head. A chair was also positioned under each of the speech bubbles. In pairs, the students were asked to role-play characters from the text, following which Gabby re-read the excerpt of the published text to the students.

A pair of students was selected by Gabby to sit on the chairs under their particular characters on the IWB and role-play their characters (i.e., the student role-playing Roxanne persuading the other student who was role-playing the Grandfather). Gabby remained at the back of the class and video/audio-recorded using a ‘Flip’ digital camera. The classroom layout during this movement is captured in Figure 5.12.
After the first pair had a turn, Gabby initiated a discussion with the class on acting techniques, such as speaking, tone of voice and body language. Another four pairs of students had a turn at sitting under the IWB and engaging in the role-playing activity.

5.5.2.5 Movement 3 – Identifying Critical Moments and Retelling of a Familiar Story

The teacher’s goal in this third movement was for students to identify critical moments and to retell a familiar story (BoS, 1998; G-D4-2.9.10). An overview of the movement’s sequence, and the key phases within, is presented in Figure 5.13.
Prior to this lesson the fiction text, *The Hairy Toe* by Daniel Postgate (2009), had been read to the class and a number of IWB and non-IWB-related activities based on the text had been completed (G-D4-2.9.10).

Gabby asked the students, who were seated on the floor facing the IWB, to orally identify the critical moments in the text, *The Hairy Toe*. As the students responded, Gabby navigated through an IWB Notebook to display a previously completed Notebook screen that presented a retelling of the first part of the story (in typed text), and a hand-drawn illustration at the bottom centre of the screen (see Figure 5.14).
The students were asked to read the retelling to refresh their memories of the story.

A discussion based on the difference between reading and retelling then took place between Gabby and the students, before Gabby turned the lights off and navigated to a new IWB Notebook screen. As a class, they brainstormed some of the things the student might do as a storyteller and Gabby recorded the responses (in hand-written form) on the IWB, using the IWB pens and star dot points (see Figure 5.15).
Figure 5.15. Recording the qualities of a storyteller

Gabby then navigated between a blank IWB screen and other Notebook screens to drag an illustration from one screen onto her blank screen. The image was then enlarged to cover the entire screen. Gabby selected a student to sit on a chair positioned directly in front of the IWB facing the class and handed a microphone, which was attached to the laptop connected to the IWB. Gabby voice-recorded, using the SMART recorder accessed via the IWB, as the student began retelling the story.

The student spoke for 50 seconds describing the house before the recording was paused and another student was selected to retell the story. The second student spoke for 41 seconds and described the woman (see Figure 5.16), before a third student was selected to continue retelling the story. The student retold the story for a further four minutes.
Gabby saved each of the recordings using the laptop attached to the IWB, asking the students to prompt her through the process of doing so. The recordings were played back to the class and Gabby asked the students to critique the storytelling voice. Storytelling techniques were again discussed.

5.5.2.2 Interpretative Summary of Activity 2

In all three movements, the IWB was used as a focal point to stimulate students’ knowledge, thoughts and understandings of particular features (i.e., character traits and critical moments) of the selected fictional text.

While the IWB was central to all three movements, the students were also provided with opportunities to engage in whole-class conversation, independent writing, paired conversation and oral reading. In movement one, for example, students participated in whole-class discussion to identify and categorise character traits, to assist in completing a future independent writing task. Gabby led the students in paired conversation as they role-played characters from the text, exploring persuasive techniques in oral language,
in movement two. In the third movement, students were provided with opportunity to engage in oral reading of past lesson creations as well as provided with opportunity to engage in whole-class critical retelling of the selected text. Literacy goals identified for all three movements were satisfied as Gabby used the IWB to provide a defined guiding framework to the literacy experiences.

Gabby demonstrated herself to be a proficient user of IWB technology during this activity, as her awareness of the affordances of such technology was evident within her literacy-based pedagogical practices. Most prominent would be Gabby’s use of the IWB as a visual display. For example, in the first movement the IWB was used as a visual display to randomly select and present adjectives related to the whole-class text. As students recorded adjectives on individual whiteboards, the IWB was used as a space students could access, to assist with their writing (the recording and spelling of individual words). The animated selection of words was visually appealing and assisted in maintaining students’ engagement within the movement. In the second movement, Gabby used the IWB to provide visual support for the students’ role-playing of characters from the text. Further, the IWB was used to display scanned images and IWB auto shapes (such as speech bubbles), which served as a background aid to support students’ character role-playing. It was through this process and Gabby’s decision to use the IWB as a visual display that expressive features of oral language were promoted. During the third movement, the IWB was used to provide visual support for the learning community as ideas were recorded (in both hand-written and oral form), thus promoting students’ oral responses. The IWB became a shared place for the documentation of students’ thoughts as Gabby materialised the students’ responses (on the IWB) obtained during the learning experience. The different coloured IWB pens and star dot points were also used to display the information in a visually appealing way.

Gabby demonstrated herself to be an efficient user of IWB technology as she was able to immediately and efficiently navigate through IWB technology, retrieve past lesson creations, as well as save, store and retrieve materials created during this activity. For example, in the first two movements the IWB was used to present and use pre-prepared, teacher-created lesson materials (i.e., the ‘Random Word Chooser’ in movement one and the scanned images with speech bubbles in movement two). These served as stimulus materials for students’ independent writing (G-A2-M1) and students’ oral role-
playing (G-A2-M2). In movement three, although Gabby was the only one who directly manipulated objects on the IWB, it was through Gabby’s use of the IWB and navigation between pages (such as text for students to read, past IWB-created lesson material and background for story retelling) stimulus materials were presented and students’ active engagement and involvement in learning was supported. The IWB was used as a repository in the third movement, as students’ brainstorming of storyteller characteristics were recorded in hand-written form and students’ retellings of a selected fiction text were audio-recorded via and stored on the IWB. The use of the IWB within this activity supported a variety of learning styles and language modes as Gabby and the students interacted with the IWB to access information as well as contribute information, thus changing the nature of interactivity (interactions and learning occurring between Gabby, the students and the IWB) within the literacy classroom.

5.5.3 Activity 3: Spelling

The teacher’s pedagogical aim in this literacy activity was to engage the students in talking and listening experiences, through conducting the weekly spelling test using the IWB (BoS, 1998). The two researcher-identified IWB movements employed to do this were:

1. Using a variety of strategies to spell familiar words (16 min); and,
2. Reviewing an independent task (10 min).

5.5.3.1 Movement 1 – Using a Variety of Strategies to Spell Familiar Words

The teacher’s goal in this first movement was for students to use a variety of strategies to spell familiar words (BoS, 1998; G-D2-31.8.10). An overview of the movement’s sequence, and the key phases within, is presented in Figure 5.17.
Prior to the lesson commencing, Gabby recorded her voice, giving instructions for the weekly spelling test and an oral recording of the actual spelling test, through the use of media player and a microphone. The IWB screen, which was displayed during the entire movement, has been captured in Figure 5.18.

Figure 5.17. Gabby’s pedagogical sequence in movement one (activity three)
Gabby informed students to listen carefully as the test would not be stopped. As students sat at their desks with their books and privacy screens (hard, coloured folders that they opened and stood up to hide their work), the pre-recorded spelling test was played through the IWB. The recording included the number of the word, the word and a sentence with the word in it, for example, “number one. I am. I am very proud of you”. The students recorded the number of the word and the word in their book. Contractions made up the spelling test and included words such as ‘she’s, she is, they’ll, they will, we’re, we are’. A student’s work sample was captured in Figure 5.19.

![Figure 5.19. Student work sample from the pre-recorded weekly spelling test](image)

Students became distressed during the spelling test; two students cried and five students complained that the recording was too fast prior to the pre-recorded reading of the fourth spelling word. Positioned at her desk, Gabby informed students that the test would be replayed. Subsequent to the ten cores spelling words being presented the recording continued on with the weekly ‘challenge words’. At this point another student began to cry. There were ten challenge words and as the test progressed the recording was inconsistent, as it became increasingly quicker and the format did not remain the
same (on three occasions during the challenge words, the number of the word in the list was not said). At one stage, the recording was incorrect as it said the number 18 twice, with two different challenge words. During the challenge words, Gabby roamed the room, watching the students complete the task.

After the spelling test had played through once, almost all the students started complaining that they missed words and that it was too fast. Gabby said that it was fast for a reason, because she really wanted the students to listen, and Gabby replayed the test, by physically touching the IWB with her finger (G-FN2-31.8.10, G-VR2-31.8.10). Gabby then roamed the room, but did not say anything. Another student (the fourth in this observation time) cried during the second playing of the spelling test recording.

Having the spelling test pre-recorded on the IWB was designed for the students to listen closely as they concentrated on the task. Gabby commented, “It’s requiring the students to listen because they can’t stop it (the recording) and ask me” (G-VR2-31.8.10). Gabby noted this to be a great listening activity, which she viewed to be a much more efficient way to conduct the weekly spelling test (G-D2-31.8.10).

5.5.3.3 Movement 2 – Reviewing an Independent Task

The teacher’s goal in this second movement was for students to review an independent task (BoS, 1998; G-D2-31.8.10). An overview of the movement’s sequence, and the key phases within, is presented in Figure 5.20.

Figure 5.20. Gabby’s pedagogical sequence in movement two (activity three)
Positioned to the left of the IWB, Gabby sat slightly elevated from the students’ direct line of sight. The students were seated on the floor with a pen and their spelling book open to their spelling test just completed. The IWB displayed a scanned image of the spelling words on the left-hand side of the screen, and covering this scanned image was a green rectangle auto shape. The pedagogical pattern for reviewing the independent task (weekly spelling test) was consistent as Gabby revealed (by dragging the green rectangle auto shape down), read and spelt each of the spelling words until the entire test was examined. Students marked their own books accordingly. Figure 5.21 captures the classroom setting whilst the independent task was reviewed.

![Figure 5.21. Reviewing an independent task](image)

During the marking process, Gabby used the left-hand side of the IWB for the scanned spelling words and stood to use the right-hand side of the IWB to write, spell and stretch out other words that were of concern. At one stage, Gabby used the right-hand side of the IWB screen to identify ‘wh’ words, which were both in the spelling test as well as in addition to the spelling test. The IWB screen at this time is captured in Figure 5.22.
Brief whole-class discussions on ‘wh’ words took place as Gabby encouraged students to verbally identify words that started with ‘wh’.

5.5.3.2 Interpretative Summary of Activity 3

In both these movements the IWB was used to present the weekly spelling words to the students, whether it be in oral or written text form.

Through the use of the IWB as a place to present pre-recorded written instructions (for example, the hand-written date in the first movement), oral instructions (for example, the IWB being used as an audio device in the first movement), scanned images (for example, the weekly spelling words and green auto shape in the second movement) and written text (for example, ‘wh’ words in the second movement), the IWB demonstrated to be a central part of both movements within this third activity. However, the use of the IWB in such ways appeared to have both positive and limited effects on literacy learning.
For example, in movement one, Gabby withdrew herself from the weekly spelling test experience as she allowed the IWB technology to lead her pedagogical practices (i.e., through the use of a pre-recording). Such use of IWB technology appeared to somewhat jeopardise students’ literacy learning, as many students became distressed for reasons attributed to the recording (i.e., the test was not stopped/paused, they were not able to go at their own pace and the recording increased in pace as the spelling words increased in difficulty). As contractions are quite often difficult to hear, Gabby’s choice of words encompassed within the spelling test and her decision to use the IWB to conduct the spelling test can be further queried. Students were asked to take responsibility for their learning, however, such an experience appeared to be too big a leap for many students. It seems that Gabby’s purpose for conducting the spelling test in such a way was not clearly explained, nor did the actual test seem clear to the students, thus raising the question of whether this was the most-effective use of the IWB? Tensions between Gabby’s IWB use and her literacy pedagogical practices were apparent, as Gabby, in this instance, primarily used the IWB as an audio device and the potential of the technology was not realised, thus compromising both the students’ literacy learning and the goal of this literacy movement.

The second movement in this third activity was initially teacher directed, however, the interactivity that occurred between Gabby, the students and the affordances of IWB technology, assisted to create a visual support for the modelling and examination of each spelling word and ‘wh’ word. The clarification of students’ understandings were also supported during the later stages of this movement as the IWB became a repository where Gabby proficiently recorded, materialised and displayed ideas for the learning community (in hand-written form). IWB features (such as using an auto shape to reveal words one at a time and highlighting ‘wh’ words) assisted in presenting students with an appropriate amount of information at any one time, as well as assisted in focusing students’ attention on specific word features. Such visually appealing material also seemed to facilitate whole-class oral discussion. Further, having students meet on the floor, rather than remain seated at their desks, appeared to have also assisted the facilitation of students’ participation within the literacy learning experience.

Overall, Gabby mostly demonstrated to be a proficient user of IWB technology during this third activity. However, as previously discussed, tensions between Gabby’s IWB
use and her literacy pedagogical practices did arise in the first movement. In such a case, it is reasonable to suggest that Gabby herself conducting the spelling test would have been a much richer literacy experience as she would be able to pause when necessary, pace the test accordingly, pronounce words more clearly and repeat words if necessary (i.e., based on students’ body language, facial expressions and non-verbal feedback). Students’ literacy learning would also benefit from Gabby herself completing the spelling test for they could view her mouth as words are pronounced and complete the test at a more appropriate pace. The tendency to focus on whole-class experiences using the IWB, rather than small group experiences is another issue of concern for IWB use and has the potential to inhibit engagement rather than enable it. Thus, as in all teaching, it is the judicious mix of strategies that leads to effective learning. The responsibility of effective literacy teaching is making the most informed choice of strategy.

5.6 **SUMMARY OF GABBY’S CASE**

5.6.1 **PEDAGOGICAL DESIGN**

5.6.1.1 **Demonstration of Literacy Knowledge**

Gabby was an experienced late-career teacher who demonstrated to be passionate about both literacy teaching and IWB technology. On the whole, Gabby demonstrated a sound understanding of literacy education, with her literacy pedagogy demonstrating her understanding of the content she presented and her purpose for incorporating it. Gabby’s enthusiasm for IWB technology was apparent and, through her IWB technology expertise, Gabby was more often than not able to facilitate literacy teaching and learning. Thus, the introduction and subsequent use of IWB technology within Gabby’s school has seen IWB use become an important part of Gabby’s whole school’s operation as well as her daily classroom operation.

5.6.1.2 **Demonstration of a Proficient Interactive Whiteboard user**

Gabby used the IWB in connection with text-based experiences and spelling experiences within her composite Year One/Two (Stage 1) class (see Table 5.1). Gabby
was observed to only use the IWB during whole-class teaching and learning experiences, facilitated by her. IWB lesson materials were teacher created, which included those that Gabby had pre-prepared (i.e., G-A1-M1, G-A2-M2; G-A3-M1, M2), past lesson materials that she had stored and retrieved (i.e., G-A2-M3) and lesson materials that were created during the movement (either herself or with students) (i.e., G-A1-M1, M2; G-A2-M3, G-A3-M2). SMART IWB Notebook templates, such as the random word chooser (G-A2-M1) were also used by Gabby, which provided students with immediate responses and feedback (Ball, 2003; Glover et al., 2005; Higgins et al., 2007; Hodge & Anderson, 2007; Kennewell & Higgins, 2007). Thus, Gabby demonstrated herself to be a proficient IWB technology user through her ability to competently navigate around the IWB software and stimulus materials, utilise a diverse range of IWB functions and affordances, as well as create, save, retrieve and reuse already constructed IWB digital lesson resources (Miers, 2005).

5.6.2 Delivery of Literacy Learning Experiences

5.6.2.1 The Interactive Whiteboard as a Focal Point

While the IWB appeared a focal point within the three activities and their associated movements, Gabby’s use of the IWB within the three IWB activities and associated movements demonstrated opportunities to cater for a variety of student learning styles. The IWB was frequently used as a visual support, which Gabby used to facilitate students’ discussion, whether it be in whole class or paired form. For example, oral discussions quite frequently coincided with visual material presented on the IWB, with specific examples of such practices including: making predictions about a text by looking at the front cover of a text (G-A1-M1); describing the setting of a text subsequent to the jointly created illustration of the text (G-A1-M2); and discussing, identifying and categorising character traits based on IWB selected adjectives (G-A2-M1).

5.6.2.2 The Interactive Whiteboard as a Repository

The IWB as a repository was also a common practice observed. Whether it be to record keywords from whole-class discussions, construct a whole-class illustration of the setting of a text or record, in audio form, students’ retelling of a text, Gabby frequently
took advantage of the IWBs affordances to immediately record, save and store lesson creations. An example of where Gabby used the IWB as a repository was in activity one. Gabby demonstrated to adopt Palincsar and Brown’s (1984, 1989) social constructivist reading technique called reciprocal teaching, whereby Gabby adopted the four strategies of predicting (movement one), questioning (movement one and two), summarising (movement one) and clarifying (movement two), in conjunction with using the IWB as a repository to engage students in the construction and clarification of meaning from a text. The IWB was also a record of student learning, thus informing future teaching experiences.

5.6.2.3 The Interactive Whiteboard as a Guiding Framework

Gabby was observed to use the IWB as a guiding framework for her literacy teaching. For example, pre-prepared questions were devised in activity one (movement one) to facilitate students’ predictions about a text as well as guide the literacy experience. Such an affordance of IWB technology allows literacy experiences to remain focused and, identified goals for literacy activities and movements remain achievable. However, the use of the IWB as a guiding framework in activity three (movement one) appeared to restrict Gabby’s pedagogical practices as it ‘locked’ Gabby in to continue to conduct the spelling experience in an ineffective manner.

5.6.2.4 Tension between Interactive whiteboard use and Pedagogical Practice

How Gabby’s pedagogical practices led her technology use came under question in one particular instance. It was during this instance (G-A3-M1) that Gabby allowed the IWB technology to replace her physical presence and lead her pedagogical practices (Staley, 2004). Gabby didn’t seem to integrate her technological and pedagogical knowledge in a way that led to intended outcomes being realised and seemed to withdraw herself from the experience. McCormick and Scrimshaw (2001) denote that unless the technology is viewed as more than an aid to efficiency, or an extension device, the potential of IWB technology may not be realised. Thus, as the IWB was used primarily as an audio device, the potential of the IWB technology (in this instance) was not realised.
literacy learning was also compromised during this experience, as an unfamiliar and disturbing environment was created for the students.

5.6.2.5 The Impact on the Nature of Interactivity through Interactive Whiteboard use

The use of the IWB within Gabby’s literacy classroom experiences appeared to have impacted on the nature of interactivity. For example, through Gabby’s and the students’ interactions with each other and the IWB, they were able to contribute information to the experience (whether it be in oral or hand-written form) as well as access information (whether it be already presented on the IWB or Gabby would immediately source information on the IWB for students to access).

Her frequent utilisation of the functions and affordances of IWB technology in connection with other pedagogical techniques demonstrated that she was a capable user of IWB technology and confident with her approaches to literacy pedagogy. However, in most cases, Gabby was the one utilising these IWB features, thus reinforcing teacher-centred styles of pedagogy (Armstrong et al., 2005; Schuck & Kearney, 2007; Smith et al., 2005, 2006).

Although physical interactivity (as identified by Moss et al., 2007) was often achieved, conceptual interactivity also occurred through the interactions and discussions that took place between Gabby, the students and the artefacts presented on the IWB. For example, through Gabby’s competent use of IWB software and her utilisation of the IWBs affordances during whole-class experiences (i.e., creating a visual support), joint discussion (a fundamental mediational tool for meaning construction – Vygotsky, 1978) was supported. Consequently, the co-construction of knowledge was supported in the majority of Gabby’s identified activities.
Kaitlyn
5.7 The School

5.7.1 Location
The school is situated in a mid-to low-socio-economic area of the western suburbs of Sydney (K-II-23.7.10) and is located in the Department of Education and Training’s Western Sydney region of NSW. The school was officially opened in the early 1990s (K-PI-23.7.10).

5.7.2 Teacher Demographics
At the time of inquiry, there were 30 full-time classroom teachers at the school, along with one principal and one deputy principal (K-PI-23.7.10). The average age of the teachers was estimated to be around the late twenties, with the majority of teachers at the school being classified as early career (K-PI-23.7.10).

5.7.3 Student Demographics
At the time of inquiry, there were approximately 640 students enrolled at the school and there were between 20 and 28 students per grade (K-PI-23.7.10). There were 30 classes in the school; 15 of these made up the infant/early years school classes (K-PI-23.7.10). Two of these 15 infant/early year classes were composite Year One/Two classes (K-PI-23.7.10).

5.7.4 A Brief History of Interactive Whiteboard Technology in the School
In 2003, the school’s first two IWBs were purchased. They were both SMART Boards and one of these IWBs was placed in the Connected Classroom (the Technology Centre of the school) while the other was portable. The principal described that buying two IWBs initially was a way to, “test the waters and see who dipped their toes in” (K-PI-23.7.10). After positive response from the majority of teachers on this initiative, additional SMART IWBs were then purchased and installed. The principal acknowledged that the installation of IWBs within the school was not an accidental thing, but instead, “a purposeful movement, based on the school’s philosophy” (K-PI-23.7.10). This being the notion of creating engaging learning environments to support lifelong learning and, “the best engaging learning environment for kids is the integration
of technology” (K-PI-23.7.10). It has been noted that the integration of IWB technology within the school has assisted with attendance and behaviour of students, particularly with boys. The principal explained:

> When we went down the technology path, it led to noticeable improvements in boy students’ playground behaviour as well as a significant rise in daily attendance … the kids appeared to be happier to come to school and also appeared to be more engaged in learning. (K-PI-23.7.10)

Since 2003, it is estimated that $350 000 to $400 000 has been spent on technology, the majority of this sum on IWB technology.

There were 33 IWBs in the school at the time of inquiry: one in each of the 30 classrooms, one in the library, one in the Connected Classroom and one in the staff room. Waves of IWB purchasing and installing within the school took place beginning with the Stage 3 classrooms, as they already had computer pods installed. Early Stage 1 (Kindergarten) classrooms were then next, based on the principal’s desire to, “capture the Kindergarten kids straight away when they come to school … so we could get them engaged in learning” (K-PI-23.7.10). Funds for the IWBs bought for the Stage 3 and Early Stage 1 classrooms were from the federal government’s Investing in our Schools initiative as well as through a promotion that Electroboard was offering, “get nine IWBs for the price of six” (K-PI-23.7.10).

The next wave of IWBs in the school was in the Stage 2 and then Stage 1 classrooms, with the exception of the demountables. IWBs were next installed in the library and the staff room. Placing an IWB in the staff room was for staff training and development purposes. The staff was encouraged to come in at any time, whether during staff meetings or recess/lunch breaks, and show others what they had learnt, created or done on the IWB (K-PI-23.7.10). It was noted by Kaitlyn’s principal that, whether it be to sit and listen or to show off an IWB resource, most teachers took full advantage of this IWB in the school’s staff room (K-PI-23.7.10). From the Stage 2 IWB installation onwards, IWB funding was on a school basis through the school’s funding and the school’s Parent and Community Committee funding (K-PI-23.7.10). The process of
purchasing and installing all 33 IWBs in the school occurred over a one-year period (K-PI-23.7.10).

5.8 THE TEACHER

5.8.1 TEACHING EXPERIENCE
Kaitlyn had been teaching for eight years, with the year of inquiry being her ninth year of teaching. Kaitlyn had taught full time at this school since graduating from university and during this time Kaitlyn had taught grades from Kindergarten to Year Six, with the exception of Year Two (K-II-23.7.10). At the time of inquiry, Kaitlyn was teaching a Kindergarten class for the second time in her career (K-II-23.7.10).

5.8.2 INTERACTIVE WHITEBOARD EXPERIENCE

5.8.2.1 History of Interactive Whiteboard use
In 2004, Kaitlyn was the first teacher at the school to have an IWB installed in her classroom. Since then, she has had an IWB permanently in her classroom. Initially, Kaitlyn independently accessed tutorials online (on IWB use) and taught herself (K-II-23.7.10). She explained, “It was just a matter of staying back after school and fiddling at lunch time. I had a Year Six class at the time and we kind of went on this journey of learning together” (K-II-23.7.10).

On a self-rated scale with one being ‘poor’ and five being ‘excellent’, Kaitlyn rated her level of expertise with IWB technology as being ‘four – very good’. She commented:

I have no problems with using my IWB. I am confident with using it as well as with the students using it. I can’t even remember a time where I have had to get someone to help me use the IWB … Come to think of it, it’s never been the case and it’s usually the other way around [Kaitlyn helping other teachers use the IWB]. (K-II-23.7.10)
Kaitlyn further acknowledged that the only challenge she faces with using IWB technology in her teaching is making sure to create quality lessons, focused on, and reflective of, syllabus outcomes and indicators (K-II-23.7.10).

Kaitlyn has used Promethean and InterWrite IWBs before, however, these interactions were only brief and were outside of her classroom teaching (i.e., staff development days). Thus, the majority of Kaitlyn’s experiences have been with SMART IWBs and Notebook software.

5.8.2.2 Interactive Whiteboard Professional Development

Initially, Kaitlyn accessed the Internet and online help resources to develop her knowledge and skills of IWB technology and its use. As more and more IWBs were purchased and installed in the school, staff meetings based on IWB use were planned with the aim of exposing everyone to the affordances of IWB technology, subsequently encouraging the use of IWB technology in their classrooms (K-PI-23.7.10).

Staff meetings focused on IWB technology became less frequent as an online learning community on the school’s Intranet was created. This was a collaborative space where the teachers at the school could upload and share any lesson ideas and resources that they had found or created. Kaitlyn acknowledged that:

I use the Intranet IWB space quite a bit … especially when it was first created. As I was the first to get an IWB, I had more resources than any other and was more than happy to upload and share them with the others [teachers]. Now, I occasionally go on there to get a lesson idea or resource, but not often. I upload more than I download. (K-II-23.7.10)

It was during this initial IWB stage in the school that Kaitlyn became the school’s IWB technology support person. As the school’s IWB technology support person, Kaitlyn trained teachers to use IWB technology, provided support to teachers when experiencing technical difficulties and shared IWB lesson creations and resources. Kaitlyn offered support within group settings such as at staff meetings or on a one-to-
one basis before school, during recess/lunch breaks, or after school (K-II-23.7.10). Kaitlyn has since passed this position over to another teacher.

Kaitlyn has also attended a number of IWB in-services that the Department of Education and Training has offered, but believes that, “They are fairly simple and basic. They taught me nothing that I didn’t already know and anyone could know what they presented in half the time at home by just fiddling” (K-II-23.7.10). In saying this, Kaitlyn still attends two IWB in-services a year stating:

I attended in-services in a hope that I will learn something new that I didn’t already know … I feel quite stale and bored with the IWB at the moment … I’ve totally plateaued a few years ago and I want to learn more things and do some different ‘wiz bang’ things and get excited about it again … but the in-services that I attend just don’t offer that. (K-II-23.7.10)

Kaitlyn has also attended two Intel ‘Teach for the Future’ programs, each one week long during school holiday periods. She acknowledged that although these programs were not specifically on IWB use, but on the general use of technology in the classroom, Kaitlyn believed that they helped her the most with integrating technology into her classroom. She explained:

They [the programs] looked at critically thinking about the technology in your classroom and integrating technology as part of your program. They [the programs] also looked at including aspects of quality teaching in connection with technology use … it is probably the only thing that has really helped me to incorporate technology and Bloom’s Taxonomy and levels of thinking. After these two programs, I came back and changed my own teaching program and integrated technology into it [her program] rather than having it [technology] separate. (K-II-23.7.10)

Kaitlyn was quick to acquire expertise in IWB technology use and took the lead in educating other teachers as the school. Kaitlyn also took the lead in sharing IWB lesson materials and resources.
5.9 The Classroom

5.9.1 Students
Kaitlyn’s Kindergarten (Early Stage 1) class comprised of 21 students, with 12 of these being boys and nine being girls (K-II-23.7.10). The class comprised of a variety of learning differences and Kaitlyn explained:

I’ve got two students on ILPs (Individual Learning Plans) … another student who is also on an ILP, who doesn’t have dyslexia, but sees things upside down and back to front … I also have one boy who is gifted and talented and has been tested for that. So there is a spread from one student going to support every morning and then the extra work I give to the gifted and talented boy. But although there is a spread, they are also a fairly mainstream class … the other students I haven’t mentioned are very average [in terms of learning abilities]. (K-II-23.7.10)

The cultural background of the students in Kaitlyn’s class is quite diverse with a total of 16 students in the class being ESL (K-II-23.7.10).

5.9.2 Setting/Layout
The classroom was positioned at the western end of the school grounds. Figure 5.23 presents a diagrammatical representation of Kaitlyn’s classroom setting/layout.
Photographs depicting Kaitlyn’s classroom setting/layout can be found in Appendix O.

5.9.2.1 Position of the Interactive Whiteboard

Kaitlyn’s SMART IWB was fixed in the middle of the southern wall of the classroom. The IWB was equipped with a long-throw projector mounted on the ceiling of the classroom (K-II-23.7.10).

There was a desktop computer permanently connected to the IWB. The computer was located to the right of the IWB on a high desk and was connected to a printer in the school’s printing room (located at the opposite end of the school, next to the school’s office) (K-II-23.7.10).

The classroom also housed ten desktop PC computers, which were positioned at the western end of the classroom. During the four observational periods, the computers were used during literacy group times.
In addition to the IWB, Kaitlyn also had two whiteboards in her classroom. One of the whiteboards was a large whiteboard, fixed on a wall to the left of the IWB. This whiteboard was not used by Kaitlyn during periods of observation but, instead, was used to display classroom paraphernalia and a timetable of daily events. The other whiteboard was an easel whiteboard, which was frequently moved around the classroom floor space by Kaitlyn and was used to demonstrate specific task components.

5.10 The Activities
Over a one-week period, four periods of observation were conducted in Kaitlyn’s classroom. These were scheduled at times identified by Kaitlyn within the class’s daily literacy session (see Table 4.3). Four pedagogical activities supported by the IWB were identified in the observations by the researcher. An overview of these is presented in Table 5.2.

Table 5.2
Overview of Kaitlyn’s activities

<table>
<thead>
<tr>
<th>Activity</th>
<th>Name of Activity</th>
<th>Movements within the Activity</th>
<th>Observation/Duration</th>
</tr>
</thead>
</table>
| 1        | Developing graphological and phonological awareness | • Identifying pictures with the same beginning letter/sound (9 min)
          |                                                      | • Identifying the letter/sound relationship of the letter ‘c’ (12 min)
          |                                                      | • Articulating sound segments in three-letter words (with the same beginning and ending sounds and different vowels) (7 min)
          |                                                      | • Recognising and identifying rhyming words (10 min)                                           | 1, 2, 3 (38 min)    |
| 2        | Recognising and identifying sight words              | • Using sight words within sentences (14 min)                                                 | 2 (14 min)           |
| 3        | Modelling reading of familiar texts                 | • Completing comprehension questions following modelled reading of a narrative (7 min)
          |                                                      | • Viewing a narrative constructed using students’ artwork and narrations (3 min)               | 1, 2 (10 min)       |
| 4        | Producing texts (explanations)                      | • Contributing to the joint construction of an explanation (16 min)                           | 2 (16 min)           |
The next sections describe and discuss each of the four activities and their associated movements.

5.10.1 Activity 1: Developing Graphological and Phonological Awareness

The teacher’s pedagogical aim in this literacy activity was to provide shared talking and listening experiences to develop students’ graphological and phonological awareness (BoS, 1998). The four researcher-identified (and teacher verified) IWB movements employed to do this were:

1. Identifying pictures with the same beginning letter/sound (9 min);
2. Identifying the letter/sound relationship of the letter ‘c’ (12 min);
3. Articulating sound segments in three-letter words (with the same beginning and ending sounds and different vowels) (7 min); and,
4. Recognising and identifying rhyming words (10 min).

5.10.1.1 Movement 1 – Identifying Pictures with the Same Beginning Letter/Sound

The teacher’s goal in the first movement was for students to identify pictures with the same beginning letter/sound (BoS, 1998; K-D1-26.7.10). An overview of the movement’s sequence, and the key phases within, is presented in Figure 5.24.

Figure 5.24. Kaitlyn’s pedagogical sequence in movement one (activity one)
As a whole-class experience, the students were positioned on the floor facing Kaitlyn and the IWB, which displayed Letterland, a similar program to Jolly Phonics. As the Letterland theme song played, Kaitlyn selected a student to begin the game and then find the letter ‘c’. The seated students orally indicated where the ‘c’ was. Another student was selected by Kaitlyn to select the ‘c’ story icon, which is captured in Figure 5.25.

The story played was about ‘clever cat’ and emphasised words that started with ‘c’. The story was interactive in that it asked students to stretch out sounds as well as physically select clues/answers that start with ‘c’. The clever cat gave instructions and Kaitlyn selected different students to come up and complete the task on the IWB (these tasks included counting the clouds and physically selecting the correct number, selecting the animal starting with ‘c’ or selecting and dragging an item on the screen to a new location). Figure 5.26 illustrates a student completing the task during this time.
A student was then selected by Kaitlyn to approach the IWB and locate a picture that started with the letter ‘c’. When the student physically selected a picture starting with ‘c’, the IWB would say the word aloud. Kaitlyn would then repeat the word, talk about the sound that a ‘c’ made in the particular word and discuss what the picture/word is (e.g., what is a carnation?). Kaitlyn then emphasised that the letter of the week is ‘c’, the sound it makes is ‘k’ and its (the letter’s/sound’s) friend is ‘clever cat’. This pedagogical pattern was repeated twelve times as Kaitlyn selected twelve students to approach the IWB one at a time to complete the IWB experience.

5.10.1.2 Movement 2 – Identifying the Letter/Sound Relationship of the Letter ‘c’

The teacher’s goal in this second movement was for students to identify the letter/sound relationship of the letter ‘c’ (BoS, 1998; K-D2-27.7.10). An overview of the movement’s sequence, and the key phases within, is presented in Figure 5.27.
Kaitlyn introduced the letter ‘c’ and its sound before an oral brainstorming exercise (where Kaitlyn chose students to orally identify words beginning with the letter ‘c’) took place. Words that the students said, and their sounds, were discussed (and not recorded).

Kaitlyn navigated through the IWB Letterland software to play the ‘c – Clever Cat’ song. Kaitlyn and the students sang the song together. A student was chosen by Kaitlyn to physically select the handwriting icon on the IWB as Kaitlyn moved to the left of the IWB. With Kaitlyn’s instructions and modelling, along with an arrow tracing a letter ‘c’ on the IWB, the students held their index finger in the air and wrote a letter ‘c’. Figure 5.28 captures the classroom setup during this time.
Kaitlyn moved to the right of the IWB and chose a student to select the capital letter IWB icon. The capital letter explanation on the IWB began and the students listened, after which Kaitlyn discussed ‘c’ and questioned the students about whether it (the letter ‘c’) changes when it is a capital.

5.10.1.4 Movement 3 – Articulating Sound Segments in Three-Letter Words (With the Same Beginning and Ending Sounds and Different Vowels)

The teacher’s goal in this third movement was for students to articulate sound segments in three-letter words (BoS, 1998; K-D3-28.7.10). An overview of the movement’s sequence, and the key phases within, is presented in Figure 5.29.
Figure 5.29. Kaitlyn’s pedagogical sequence in movement three (activity one)

There were three students in the literacy group and they sat on the floor facing the IWB and Kaitlyn, who was seated on her chair to the left of the IWB. The IWB displayed a yellow Notebook screen titled, ‘Funny words’. Below the title was the word ‘sud’, with the ‘u’ being a face of a dice. Kaitlyn pointed to each of the letters in ‘sud’ as it was stretched out and they discussed whether the word ‘sud’ was real or not. Kaitlyn chose each student (one at a time) to physically select the dice and change the vowel. Each time the dice spun, a new vowel was displayed, and the new word (made from the new vowel), which was then stretched out by Kaitlyn and the students. Kaitlyn also used the IWB pen to write other words that the students had stretched out. Kaitlyn wrote three words and converted two of them to foundation-style text (this is captured in Figure 5.30).
Figure 5.30. Articulating sound segments in words

The IWB ‘blind’ feature to hide and highlight individual letters and sounds in words presented on the IWB was also used.

5.10.1.5 Movement 4 – Recognising and Identifying Rhyming Words

The teacher’s goal in this fourth movement was for students to recognise and identify rhyming words (BoS, 1998; K-D3-28.7.10). An overview of the movement’s sequence, and the key phases within, is presented in Figure 5.31.
Figure 5.31. Kaitlyn’s pedagogical sequence in movement four (activity one)

There were six students in this literacy group and they sat on the floor facing the IWB and Kaitlyn, who kneeled on the floor to the right of the IWB. The IWB displayed a blue Notebook screen titled, ‘Rhyming words’. Below the title was a definition of rhyming words (see Figure 5.32).

<table>
<thead>
<tr>
<th>Orientating a small group of students to rhyming words by presenting a pre-prepared, teacher-created IWB resource with a definition of rhyming words</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recognising and identifying rhyming words presented on the pre-prepared, teacher-created IWB resource as a small group</td>
</tr>
<tr>
<td>Identifying, recording and stretching out additional words that rhyme with the two words already presented on the pre-prepared, teacher-created IWB resource as a small group</td>
</tr>
</tbody>
</table>

Figure 5.32. A definition of rhyming words
Kaitlyn pointed to each word on the IWB as she read the definition. Another IWB screen was then navigated to by Kaitlyn, which displayed a question, ‘Do we rhyme?’ followed by two labelled pictures (see Figure 5.33).

![Figure 5.33. Recognising and identifying rhyming words](image)

Kaitlyn asked the students if the two words (bun and sun) sounded the same and they discussed their sounds as a group. Kaitlyn circled ‘un’ in both words to highlight word endings within both words. A student was asked by Kaitlyn to approach the IWB to identify and write a word on the IWB that rhymed with ‘bun’ and ‘sun’. Once the student identified a word, a discussion took place on whether it rhymed with ‘bun’ and ‘sun’, before they assisted the student to record the word on the IWB by orally stretching out the word. Figure 5.33 illustrates this process.

The pedagogical pattern of Kaitlyn inviting a student to approach the IWB and identify a rhyming word, students orally stretching out the word and the student recording the word on the IWB was repeated six times as each student in the group had a turn at recording a rhyming word on the IWB.

5.10.1.6 Interpretative Summary of Activity 1

In all four movements the IWB was used to engage students and stimulate their graphological and phonological awareness, within both whole class and small group experiences.

The IWB was central to all four movements within this first activity. The literacy program Letterland was used in the first two movements and was an IWB learning
object that consisted of a combination of components, such as sound, graphic, text, video and animation, which Kaitlyn and the students interacted with. For example, in the first movement Kaitlyn used the IWB as an interactive experience, where students manipulated the IWB software to play a story before locating words that begin with the same sound. In the second movement, Kaitlyn used the phonics software Letterland, to provide whole-class shared experiences for students to identify letter/sound relationships as they participated in the singing of a familiar song. Students’ handwriting skills were also supported as the students used their index fingers to write the letters independently, with Kaitlyn modelling and emphasising the process of construction. Students’ handwriting skills were further supported as Kaitlyn questioned students on their recognition of capital and lower-case letters. All students appeared engaged in the process of letter construction using their bodies and space around them. Thus, the IWB was central in this activity and, as indicated in both the above-mentioned examples, the students used the IWB to navigate through the software and complete the activities presented within the software that is, listening to a story singing the song and handwriting.

The learning object used in both movements was used as a guiding framework in order to assist with the structure and momentum of both movements (i.e., movement one and movement two) as responses and feedback from students’ direct manipulations with the IWB software were immediate. Such feedback from direct manipulations with the IWB served to stimulate and support dialogue between Kaitlyn and the students. Kaitlyn’s choice to adopt commercially produced phonics software highlights her sound understanding of IWB technology. However, her ability to adapt such software in connection with her understanding of literacy and associated pedagogical practices to create a deeper and more meaningful literacy environment becomes questioned by the researcher in this instance.

Kaitlyn’s proficient use of the IWB in this activity demonstrated her awareness of the affordances of the tool to support her teaching as she used the IWB to present animations (K-A1-M3) and images (K-A1-M4) within her teacher-created lesson materials. For example, in the third movement, Kaitlyn used the IWB to display a word, with the simple option to change the middle letter (the vowel) through the use of the moving dice. The ability of the IWBs dice to immediately change its vowel face,
allowed for the efficient generation and presentation of words. The inclusion of the IWB dice feature also assisted students to recognise that words are made up of letters, recognise words with the same sound or given sound as well as hear and articulate sound segments in consonant-vowel-consonant (cvc) words. The IWBs blind feature was used to highlight specific sounds and letters in words. Other IWB features (such as converting hand-written text to typed text) were also used within this movement. Such a feature assisted Kaitlyn to present information to the students in a more legible manner. In the fourth movement, Kaitlyn used the IWB to present images and labels to stimulate students’ responses. Further, the IWB was used as a space to display information to the six students as well as capture students’ thoughts and ideas. The use of the IWB in this way supported students’ direct physical manipulations with the IWB (i.e., by writing words on the screen) and also facilitated the questioning and conversations that took place between Kaitlyn and the students. Thus, the IWB was used as a repository and formative assessment in the third and fourth movements, as students’ responses were shared and recorded (by both Kaitlyn and the students) on the IWB.

5.10.2 ACTIVITY 2: RECOGNISING AND IDENTIFYING SIGHT WORDS
The teacher’s pedagogical aim in this literacy activity was to provide experiences promoting students’ recognition and identification of sight words (BoS, 1998). The one researcher-identified IWB movement employed to do this was focused on using sight words within sentences (14 min).

5.10.2.1 Movement 1 – Using Sight Words within Sentences
The teacher’s goal in this movement was for the students to use sight words within sentences (BoS, 1998; K-D2-27.7.10). An overview of the movement’s sequence, and the key phases within, is presented in Figure 5.34.
Kaitlyn used the computer attached to the IWB to navigate to the lesson resource. The IWB displayed three sight words (that, as, run) and a jumping kangaroo animation. Initially, the entire IWB screen was hidden using the IWB ‘blind’ feature.

The students were seated on the floor facing the IWB, while Kaitlyn used the ‘blind’ option to hide the IWB screen and drag the blind down to reveal the words one at a time. As each word was revealed, Kaitlyn encouraged the students to stretch out the word, looking for common digraphs such as ‘th’ in ‘that’. Kaitlyn also circled words within the word (such as ‘at’ in ‘that’) on the IWB, to assist students to stretch out and read the word. Figure 5.35 captures the whole-class experience at this time.
After each word was stretched out and repeated by the students, Kaitlyn orally put the word into a sentence. As Kaitlyn revealed the words, the students saw the kangaroo animation. The students became excited and began calling out. Kaitlyn used the ‘blind’ to hide the entire screen and waited for the students to settle. Kaitlyn did not directly refer to the jumping kangaroo animation during this experience. Once all three words were revealed and stretched out, the ‘blind’ was used by Kaitlyn to hide the entire screen. She dragged the ‘blind’ down, revealing the words one at a time, while the students read them out aloud.

Kaitlyn navigated to a different IWB Notebook screen and demonstrated how the sight words can be put into sentences. Figure 5.36 illustrates the experience at this point in time.
Kaitlyn pointed to the words in the sentence and together they read the sentences slowly, stretching out each word read. This process was repeated as the remaining text was read. Kaitlyn navigated to the next screen that displayed two sentences with one word deleted. On the right-hand side was a three-worded word bank (see Figure 5.37).
After Kaitlyn read out the sentences using each of the word bank words to replace the deleted word, a student was selected by Kaitlyn to drag a word from the word bank into the highlighted area to complete the sentence. As a whole class, the sentences were then read out aloud to check that the chosen word made sense in the sentences.

Kaitlyn navigated to another IWB screen where the two sentences were displayed, with its animation, and typed instructions along the top of the screen. The animation corresponded to the sentences presented and the instructions read, ‘Underline the sight words. Put a circle around the nouns. Underline the capital letter, question mark and exclamation mark’ (see Figure 5.38).
Kaitlyn selected two students, one at a time, to complete two of the three instructions (excluding the noun instruction), using the IWB pens and the IWB eraser (if necessary). Brief discussions (e.g., on the location of capital letters at the beginning of sentences) took place during this time.

5.10.2.2 Interpretative Summary of Activity 2

In this activity the students were presented with experiences to read and decode sight words before using sight words to construct sentences.

Kaitlyn used the IWB to introduce, present and use sight words of the week during whole-class IWB experiences. In engaging with this process, Kaitlyn used the IWB as a guiding framework to navigate between IWB materials and experiences during the movement. This assisted with maintaining the structure and momentum of the movement and, further, assisted in providing a smooth shift in literacy focus (from sight words to punctuation) during the movement. All IWB material used during this movement was pre-prepared, purposefully made lesson material constructed by Kaitlyn.
Students’ talking and listening skills were encouraged as students were continually repeating sounds in words (in correct sequence) as well as providing oral and non-oral answers to simple questions posed by Kaitlyn. Further, students’ reading skills and strategies were supported, as experiences within this movement, such as using the IWB to physically identify sight words and nouns, required and stimulated students to identify nouns, recognise that words are made up of letters, hear and articulate sound segments in words as well as to recognise sight words in printed texts. These skills were considered by Kaitlyn to be prerequisites in learning to read.

Kaitlyn’s proficient use of the IWB in this activity demonstrated her awareness of the affordances of the tool to support her teaching, and the inclusion of animations appeared to motivate and further engage students. However, during the initial parts of the movement, it appeared such animations were not connected to the content and had the effect of over-exciting and distracting students. Kaitlyn’s use of the IWBs ‘blind’ feature to hide the animations was then utilised to combat such cases. Further, the use of the ‘blind’ feature assisted in focusing students’ attention on particular information presented on the screen (such as the word bank), as well as assisting as a behaviour management strategy (to refocus students’ attention) when they became over-excited about the animations on the IWB screen. During the latter stages of the movement, animations were also used to capture students’ attention. Such animations (e.g., koala flying a kite) allowed Kaitlyn to show connection between literacy modes, as the animations directly related to the content and learning experience presented on the IWB. Thus, Kaitlyn’s choice to use and incorporate animations in this instance demonstrated to emphasise animation as a scaffolding tool.

5.10.3 ACTIVITY 3: MODELLING READING OF FAMILIAR TEXTS

The teacher’s pedagogical aim in this literacy activity was to provide modelled reading experiences, with the IWB being in place of the teacher. The two researcher-identified IWB movements employed to do this were:

1. Completing comprehension questions following modelled reading of a narrative (7 min); and,
2. Viewing a narrative constructed using students’ artwork and narrations (3 min).
5.10.3.1 Movement 1 – Completing Comprehension Questions Following Modelled Reading of a Narrative

The teacher’s goal in this first movement was for students to complete comprehension questions following the modelled reading of a narrative (BoS, 1998; K-D1-26.7.10). An overview of the movement’s sequence, and the key phases within, is presented in Figure 5.39.

![Diagram showing sequence of events]

**Figure 5.39.** Kaitlyn’s pedagogical sequence in movement one (activity three)

The IWB displayed a cover of a narrative as Kaitlyn asked students who had completed their independent task to come to the floor. Four students came and sat on the floor facing the IWB and watched the narrative ‘Walk, Ride, Run’, which included a slideshow of images on the IWB with a voiceover reading the narrative. There were no printed words in the visual representation of the narrative and the students had heard this narrative before. During the reading of the narrative, Kaitlyn roamed the room assisting the students at their desks to complete their work. More and more students came to the floor to join in the narrative once they completed their independent work. By the end of the narrative, there were eight students seated on the floor and one student standing, watching and listening (see Figure 5.40).
Once the narrative was over, there were a variety of related options and activities presented on the IWB. By this stage, there were ten students seated on the floor in front of the IWB. A student, without being asked by Kaitlyn, approached the IWB and used her finger to physically select the ‘complete the sentence’ activity. The IWB screen changed and a voiceover said, ‘Drag the correct word to the space, and then click OK. Click the green arrow to continue’. The word and arrow (mouse) moved according to the voiceover and the instructions it was giving. Kaitlyn appeared to expect the students taking this initiative. The IWB screen then automatically changed to display a comprehension question, based on the narrative just read, and a student was selected by Kaitlyn (who was now sitting at a desk helping students complete their work) to complete the first sentence (see Figure 5.41).
The student was then asked by Kaitlyn (after she had completed the first sentence) to choose another student to have the next turn. The student standing selected another student who then approached the IWB and looked at the IWB screen, without physically interacting with it. Kaitlyn, still seated at a student’s desk, read the sentence aloud using ‘hmm’ for the missing word and then replaced the missing word in the sentence with each of the three words in the word bank. The students on the floor were calling out the correct answer and the student at the IWB physically selected and dragged the appropriate word into the sentence (using her knuckles), before selecting a student to have the next turn. Figure 5.41 depicts both a completed comprehension question and a student completing a comprehension question on the IWB.

The third student approached the IWB and looked at the screen. Kaitlyn moved to the chair to the left of the IWB and asked all the students, who were still at their desks, to come to the floor. Kaitlyn then read the sentence four times. The first time she read the sentence Kaitlyn paused for the missing word. Kaitlyn read the sentence another three times, each time replacing the missing word with one of the three words in the word bank. The students called out the answer and the student at the IWB physically dragged, using their finger, the correct word into the space and selected ‘OK’. Another student was selected by Kaitlyn to approach the IWB and read the sentence aloud. The student did so and independently dragged the correct word into the sentence.
5.10.3.2 Movement 2 – Viewing a Narrative Constructed using Students’ Artwork and Narrations

The teacher’s goal in this second movement was for students to view a narrative constructed using students’ artwork and narrations (BoS, 1998; K-D2-27.7.10). An overview of the movement’s sequence, and the key phases within, is presented in Figure 5.42.

![Diagram](image)

**Figure 5.42.** Kaitlyn’s pedagogical sequence in movement two (activity three)

The students were seated on the floor, while Kaitlyn was seated at the IWB computer, to the right of the IWB screen. Kaitlyn asked the students to be quiet and informed them that they will be watching a narrative. A student called out asking if Kaitlyn herself could read them a narrative using a physical text, with six other students calling out saying, “yeah”. Kaitlyn said “no”, and double clicked on the narrative and it began playing. The narrative was called ‘Ed-E the Robot’ and was a collection of students’ artwork, pieced together to form a narrative. There was also a narration for each of the students’ drawings. The narration was the voice of the student that the drawing belonged to. The narrative was created in, and played, using media player.

5.10.3.3 Interpretative Summary of Activity 3

In both these movements the IWB was used to provide modelled reading experiences during short periods of time between planned classroom experiences.

The IWB was central for the sharing of resources in both movements as Kaitlyn used the IWB to present modelled reading learning objects during a small group experience (movement one) and a whole-class experience (movement two). For example, in the first movement, Kaitlyn used the IWB as a display to provide students with a small
group reading activity, whereby the students watched and listened to a narrative (learning object) being read to them on the IWB, independent of the teacher. The IWB was used to model reading, appearing to take the place of the teacher. In the second movement, as a whole-class experience, students were able to listen to and view a narrative constructed using students’ narrations and artwork. The IWB took the place of the teacher’s role in modelling reading. Interestingly, some students asked for Kaitlyn to read them a narrative, as opposed to one being read on the IWB. Such a request poses questions for the differing quality of interactions between students and the teacher, as opposed to the students and the IWB, and what an IWB may lack. It was also during this time that the students made assumptions about the teacher’s role in a modelled reading session. It seems reasonable to suggest that Kaitlyn, in this instance, overused the IWB technology by purposefully incorporating it within this teaching and learning experience to replace her physical presence (Staley, 2004).

The affordances of IWB learning objects were apparent in this activity, particularly in the first movement, where students were provided opportunity to listen to computerised information (during the reading of the narrative), respond to computerised instruction and navigate through sections of the learning object, when completing the comprehension questions, that is, by physically selecting the correct answer and pressing the ‘OK’ icon. The inclusion of comprehension questions, based on the narrative just modelled, stimulated students’ comprehension of the narrative. Through the IWBs ability to provide immediate feedback, the IWB allowed navigating through these questions and responding to these questions to be more efficient. Thus, the computerised information and instruction acted as a guiding framework during this first movement, as students interacted with the IWB to complete the task presented.

5.10.4 Activity 4: Producing Texts (Explanations)

The teacher’s pedagogical aim in this literacy activity was to provide shared writing experiences to promote students’ production of texts (explanations) (BoS, 1998). The one researcher-identified IWB movement employed to do this was focused on contributing to the joint construction of an explanation (16 min).
5.10.4.1 Movement 1 – Contributing to the Joint Construction of an Explanation

The teacher’s goal in this movement was for students to contribute to the joint construction of an explanation (BoS, 1998; K-D2-27.7.10). An overview of the movement’s sequence, and the key phases within, is presented in Figure 5.43.

Kaitlyn used the cordless mouse and keyboard to access the upcoming literacy experience. The students sat on the floor facing the IWB that displayed a pre-prepared Notebook page with the heading ‘Snails’, a picture of a snail and a title, ‘A simple explanation about how a snail moves’ (see Figure 5.44).
The students orally identified the snail character before Kaitlyn briefly discussed that the snail was Garry from *SpongeBob SquarePants*, as well as briefly introduced the text type, explanations. Kaitlyn then navigated to a minimised YouTube window, located at the bottom of the IWB screen and, as a class, they watched the 30 second YouTube video of a snail moving. During the playing of the video Kaitlyn knelt to the left of the IWB and continually made comments and questions such as, ‘have a look at how he is moving. Is he going fast or slow? Is he walking on legs or feet?’ The students were calling out answers as they watched the IWB and listened to Kaitlyn. The video was replayed and Kaitlyn commented and questioned, ‘Have a look. I can see his body. I can see his shell. I can see … what’s coming out the back? Slime. I can see his head’, as she pointed to the different parts of the snail. The students were calling out and commenting on what they could see. Kaitlyn paused the video and gave further commentary as to what she could identify and observe on the IWB screen. The students

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*SpongeBob SquarePants* is a cartoon produced in 1999 by United Plankton Pictures Nickelodeon Animation Studies and is broadcast on the Nickelodeon channel.
were also asked what they could see and a discussion took place on the shell, slime and the reason why snails leave slime.

Kaitlyn minimised the YouTube window and navigated through her pre-prepared snail Notebook to display a teacher-created labelling experience. Kaitlyn pointed to the first word, ‘shell’, stretched it out as she read it, selected a student to approach the IWB to use their finger to physically drag the word to the appropriate arrow on the IWB screen, before Kaitlyn orally provided information about the particular part of the snail. The pedagogical pattern of Kaitlyn stretching out the word, selecting a student to drag the word to the correct arrow and Kaitlyn orally providing information about the particular part of the snail, was repeated until all parts of the snail were labelled. Figure 5.45 captured a student completing the IWB labelling experience.

Once the snail on the IWB was labelled, Kaitlyn introduced a snail worksheet and demonstrated how to complete it (label, colour and cut) on her whiteboard. The worksheet was an individual activity of what was just completed as a class on the IWB. The labelled snail on both the IWB screen and worksheet on the whiteboard were
displayed the entire time while the students were completing their worksheet. The classroom setting at this time is captured in Figure 5.46.

![Figure 5.46. Completing an independent task](image)

Kaitlyn roamed the room assisting students (by referring them to both the whiteboard and the IWB) to complete their independent task.

5.10.4.2 *Interpretative Summary of Activity 4*

In this activity the IWB was used to display stimulus materials (i.e., familiar characters and video clips), build a field of knowledge on a particular topic (snails) as well as model and promote students’ production of texts (explanations).

The IWB was central to this activity as Kaitlyn used the IWB to model and provide visual support, through the inclusion of a familiar character (Garry from *SpongeBob SquarePants*) as well as through the use of a YouTube video clip on an actual snail. Such use of the IWB promoted students’ discussion on information presented in still and moving images (such as video clips). Kaitlyn was able to engage students in the
literacy experience through connections made to popular culture (i.e., illustration of Garry the snail from *SpongeBob SquarePants*). Further, Kaitlyn was able to build field knowledge about snails, through vocabulary and extension through questioning that ran alongside the multimodal YouTube text. Kaitlyn’s use of the IWB and YouTube clip alongside her pedagogical practices to build field knowledge capitalised on the affordances of both experiences.

Kaitlyn also used the IWB to develop students’ technical language by modelling an example of how to label parts of a snail, through the IWBs drag and drop feature. Such whole-class experiences supported students to talk, listen and contribute to whole-class discussions on the topic, as well as contribute to the joint construction of texts. Further, this whole-class experience assisted students’ technical language knowledge as they identified and selected words to label specific parts of a drawing (the snail).

The IWB was also used as a visual stimulus and support for students, as the screen displayed the whole-class construction of the labelling of the snail in order to assist students with the completion of their individual task (which was the same, only on a worksheet). As such, the IWB allowed for representation of understandings in different genres (quickly and easily) as it was used as classroom material for students to visually refer to and assist their own writing. Thus, Kaitlyn’s proficient use of the IWB in this activity demonstrated her awareness of the affordances of the tool to support her teaching. Further, through Kaitlyn’s proficient use and the presentation of such experiences, students’ understanding of snails as well as students’ understanding and production of an explanation, as a text type, were supported.

**5.11 SUMMARY OF KAITLYN’S CASE**

5.11.1 PEDAGOGICAL DESIGN

5.11.1.1 Demonstration of Literacy Knowledge

Kaitlyn was a mid-career teacher who demonstrated to be highly interested in both literacy teaching and IWB technology use within her literacy practices. In general, Kaitlyn demonstrated a sound understanding of literacy development, with her literacy
pedagogy demonstrating her understanding of the content she presented and her purpose for incorporating it. Kaitlyn’s enthusiasm for IWB technology was apparent through her IWB technology expertise and she demonstrated to facilitate literacy teaching and learning. Thus, the introduction and subsequent use of IWB technology within Kaitlyn’s school has seen IWB use become an important part of Kaitlyn’s whole school’s operation as well as her daily classroom operation.

5.11.1.2 **Demonstration of a Proficient Interactive Whiteboard user**

Kaitlyn had a Kindergarten (Early Stage 1) class and she was observed to use the IWB during whole class and small group times. There were no times when Kaitlyn used the IWB one-on-one with a student, and there was only one brief time (K-FN1-26.7.10) when the students used the IWB independent of Kaitlyn. IWB lesson materials included a range of resources: phonics software (e.g., K-A1-M1, M2); Kaitlyn’s own IWB lesson creations (e.g., K-A1-M3, M4); and Internet sites (e.g., K-A4-M1). Thus, Kaitlyn’s sources of IWB resources were diverse, as she predominantly used the IWB in connection with graphological and phonological experiences (Kaitlyn’s first and second activities), as well as with text-based experiences (Kaitlyn’s third and fourth activities) (see Table 5.2).

Interactions with the IWB in Kaitlyn’s classroom were primarily through the physical manipulations of objects on the IWB screen and her focus was “on ‘going up to the front’ and manipulating elements on the IWB” (Moss et al., 2007, p. 40). Kaitlyn used the computer connected to the IWB, but this was mainly to locate and initially present an IWB experience (e.g., K-A2-M1). Kaitlyn did not use a cordless mouse and/or wireless keyboard during the observational periods, nor appear to have them as part of her IWB technology setup.

Kaitlyn utilised many of the IWBs functions and affordances including animation (e.g., K-A2-M1), converting hand-written text to typed text (e.g., K-A1-M3), writing and recording information directly onto the screen (e.g., K-A1-M4), dragging and dropping objects/text (e.g., K-A3-M1) (Glover et al., 2005; Kennewell & Higgins, 2007), efficiently navigating between IWB screens (e.g., K-A2-M1) as well as hiding and revealing objects/text presented on the IWB screen (e.g., K-A2-M1) (Glover et al.,
2005; Kennewell & Higgins, 2007). Although the animation feature captured students’ attention, Kaitlyn was observed using another IWB affordance (the hide and reveal feature) to ‘hide’ the original IWB affordance (such as an animation) in order to focus students’ attention. The frequent physical interactions the students had with the IWB (e.g., manipulating objects on the IWB screen) also facilitated the questioning and conversations that took place between Kaitlyn and the students, thereby supporting the joint construction of meaning. Thus, Kaitlyn’s constant utilisation of a variety of IWB functions and affordances, as well as the type and quality of students’ constant interactions with the IWB, demonstrated that Kaitlyn was a confident and proficient IWB user.

5.11.2 Delivery of Literacy Learning Experiences

5.11.2.1 The Interactive Whiteboard as a Focal Point

The IWB was a focal point in all four activities and their incorporated movements. Kaitlyn’s use of the IWB during these four activities seemed to cater for a variety of learning styles, particularly those of oral and visual styles of learning. For example, in the first two movements of activity one, Letterland software was used to provide students with a visual display, with complementing sound, as students followed teacher and computerised instruction to participate in the literacy learning experience. Another interesting example where the IWB was the focus was in activity four where the IWB was used as a visual support to display stimulus materials (i.e., familiar characters and video clips), build a field of knowledge on a particular topic (snails) as well as model and promote students’ production of texts (explanations). In all other movements and activities, the IWB was the focal point as students sat on the floor in front of the IWB, while in this case (activity four), the IWB remained the focal point, even when students were asked to sit at their desks and complete an individual activity. This is because the IWB remained a visual display for students to refer to in order to assist them to complete their independent task.

5.11.2.2 The Interactive Whiteboard as a Repository

The IWB as a repository was a practice Kaitlyn incorporated within all of her literacy-based IWB activities and their associated movements. For example, the IWB was
commonly used to retrieve learning objects (such as Letterland and YouTube video clips) as well as teacher-created resources (such as when identifying three-letter words and words that rhyme). Such materials were sourced and retrieved from Kaitlyn’s own resource storage, the Internet and the school’s Intranet. Further, the retrieval, recording and storing of information and students’ responses (as a result of discussion or questioning from Kaitlyn) allowed material to be immediately presented on the IWB for all to see and use.

5.11.2.3 The Interactive Whiteboard as a Guiding Framework

Kaitlyn used IWB learning objects as a guiding framework during the majority of her literacy-based IWB activities. The incorporation of learning objects enabled a combination of IWB features such as sound, graphics, text, video and animation, to be used (Miers, 2005). For example, in the first and second movements in activity one as well as movement one in activity three, students were able to efficiently navigate through the familiar IWB software. Immediate responses and feedback from students’ physical interactions with the IWB (as they manipulated objects on the screen to complete literacy-based learning experiences) also occurred through the use and incorporation of the software, thus demonstrating to support dialogue between Kaitlyn and the students. Furthermore, through teacher instruction (in the first and second movements in activity one) and through computerised instruction (in the first and second movements in activity one and the first movement in activity three) Kaitlyn was able to maintain lesson material to be focused and on track. Such practices resulted in continuing to support and scaffold students’ attention and learning throughout the experiences.

5.11.2.4 Tension between Interactive Whiteboard use and Pedagogical Practice

Kaitlyn’s choice to adopt commercially produced phonics software (K-A1-M1, M2) highlights her sound understanding of IWB technology. However, her ability to adapt such software in connection with her understanding of literacy and associated pedagogical practices to create a deeper and more meaningful literacy environment becomes questioned.
Kaitlyn didn’t seem to integrate her technological and pedagogical knowledge in a way that led to intended outcomes being realised in one of her observed literacy movements. Movement two within activity three generated questions about Kaitlyn’s use of IWB technology as she purposefully incorporated a learning object (the reading of a narrative) to replace her physical presence (Staley, 2004). Students asked Kaitlyn to read them a narrative, as opposed to one being read on the IWB. This poses questions to the differing quality of interactions between students and the teacher (as questions of relationship between teacher and student are asked) as opposed to the students and the IWB, and what an IWB may lack. However, although this instance occurred, in the majority of cases, Kaitlyn demonstrated to use the IWB and incorporated resources in a pedagogically appropriate manner.

5.11.2.5 The Impact on the Nature of Interactivity through Interactive Whiteboard use

The use of the IWB within Kaitlyn’s literacy classroom experiences demonstrated to have impacted on the nature of interactivity as the use of multimedia are central in the affordances of IWB technology. In particular, the use of learning objects, such as in the first and second movements within activity one, demonstrated to promote both conceptual and physical interactivity as students were presented with visually appealing and oral experiences that facilitated students’ interactions with the teacher, each other and the IWB (Moss et al., 2007).
DECLAN
5.12 THE SCHOOL

5.12.1 LOCATION
The school is situated in a rural middle to low socio-economic area located in the Department of Education and Training’s Illawarra and South East region of NSW (D-II-6.8.10).

5.12.2 TEACHER DEMOGRAPHICS
At the time of inquiry, there were eight full-time teachers at the school, along with one principal and one deputy principal (D-PI-6.8.10). The teachers’ ages and stages of career vary greatly. Declan explained, “Our teachers range from early career teachers, in their first couple of years of their careers, to teachers in the last couple of years of their careers and everywhere in between” (D-II-6.8.10). The average age of classroom teachers at the school was estimated by the principal to be in the late 30s (D-PI-6.8.10).

5.12.3 STUDENT DEMOGRAPHICS
There were approximately 230 students enrolled at the school at the time of inquiry with between 19 and 45 students per grade (D-PI-6.8.10). There are eight classes in the school; four of these making up the infant/early years school classes (D-PI-6.8.10). Two of these four infant/early years classes are composite Year One/Two classes (D-PI-6.8.10).

5.12.4 A BRIEF HISTORY OF INTERACTIVE WHITEBOARD TECHNOLOGY IN THE SCHOOL
In 2009, through school and Parent and Community Committee funding, eight IWBs were installed, equipping each classroom in the school with IWB technology. IWBs were installed in response to the principal’s personal view of the potential for technology within classroom practice and the vision he had for the school (D-PI-6.8.10). As Declan explained, “the principal went to a seminar on IWB technology one day … and the following day, eight IWBs were ordered!” (D-II-6.8.10). As the principal highly valued IWB technology, regular use of the technology within classrooms at the school was expected.
The principal was adamant that the installation of these resources would provide equity to both the staff and children. In response to this, an IWB was installed in every classroom over a one-week period. Most teachers were excited at the thought of having IWBs installed so quickly and at such short notice (D-PI-6.8.10). A few months following this installation, a ninth IWB was installed in the school hall. This IWB was equipped with video-conferencing facilities and was funded by the Department of Education and Training. All IWBs installed in the school were SMART IWBs.

5.13 THE TEACHER

5.13.1 TEACHING EXPERIENCE
Declan had been teaching for seven years with the year of inquiry being his eighth year of teaching. During this time, Declan had been employed by the NSW Department of Education and Training and worked casually at five primary schools and permanent at two primary schools. 2010 was Declan’s second year of full-time employment at this school. During his teaching career, Declan had taught both casually and full time all Stages and grades from Kindergarten to Year Six. At the time of inquiry, Declan was teaching a Kindergarten class (for the second time in his career).

5.13.2 INTERACTIVE WHITEBOARD EXPERIENCE

5.13.2.1 History of Interactive Whiteboard use
At the time of inquiry, Declan had been using an IWB in his classroom practice for one year (D-II-6.8.10). Although Declan is very aware of other forms of IWBs available, Declan has only interacted with and used SMART IWBs and Notebook software. At the time of inquiry, Declan had a permanent SMART IWB in his classroom. During his initial interactions with IWB technology, Declan acknowledged that, “Although I had been shown some of the IWB features, like a lot of technology, it’s mainly just been experimenting and figuring it [IWB technology] out for yourself. I think that’s the key … just have a fiddle and a play” (D-II-6.8.10).

Declan has become the school’s technology coordinator and has assisted other teachers at the school with embedding IWB technology in teaching practice. He assisted other
teachers by demonstrating how to use IWB software (such as Notebook 10) as well as providing them with access to his own IWB lesson materials and resources. Declan’s role as the school’s technology coordinator has also resulted in Declan’s creation of a shared online IWB resource environment on the school’s Intranet.

On a self-rated scale, with one being ‘poor’ and five being ‘excellent’, Declan rated his level of expertise with IWB technology as being ‘five – Excellent’. He explained, “I would have to go excellent because not only have I used it in the classroom, but I have also done training on the use of IWBs within the school to train the other teachers as well” (D-II-6.8.10).

5.13.2.2 Interactive Whiteboard Professional Development

Besides an initial three-day IWB Department of Education and Training course funded by the school, Declan had not attended any other formal IWB training. He identified that he has taught himself and the other teachers at the school through collaborative teaching experiences during staff meetings, lunch breaks and before and after school hours. Declan acknowledged that his IWB skills were beyond the ‘basic’ level and, “there is just no point in attending any other IWB training courses because they are still training at that ‘basic’ level” (D-II-6.8.10). Thus, Declan felt that his IWB competency was at a higher level than any training course offered.

5.14 The Classroom

5.14.1 Students

Declan’s Kindergarten (Early Stage 1) class comprised of 20 students, with 12 of these being boys and eight being girls (D-II-6.8.10). There was one student who came from a non-English speaking background. A teacher’s aide supported this student three times a week (D-II-6.8.10). Declan explained that because it was only halfway through the year (at the time this research was conducted) there were still some Kindergarten students yet to be officially identified with significant behavioural or learning differences. He explained, “there are certainly some more challenging students [in reference to behaviour] in the room and there is certainly one particular student that has some fairly
high academic needs in that he is functioning at a Year Two level for numeracy” (D-II-6.8.10).

5.14.2 SETTING/LAYOUT

The classroom was attached to two other classrooms and shared a common hall with both of these. The row of these three classrooms made the southern-side border of the Covered Outdoor Learning Area (COLA), which was positioned in the centre of the school. Figure 5.47 presents a diagrammatical representation of Declan’s classroom setting/layout.

![Declan's classroom setting/layout diagram](image)

*Figure 5.47. Declan’s classroom setting/layout*

Photographs depicting Declan’s classroom setting/layout can be found in Appendix P.

5.14.2.1 Position of the Interactive Whiteboard

Declan had a SMART IWB in his classroom, which was fixed in the centre of the western wall of the classroom. A short-throw projector accompanied the IWB. A wireless keyboard was located to the left of the IWB (on the floor near Declan’s chair)
and a wireless mouse was located on a table (next to Declan’s chair) to the left of the IWB.

The computer connected to the IWB was a PC desktop computer, which was permanently located on the northern wall of the classroom, in a row of three desktop computers. The computers (except the one connected to the IWB) were mainly used during reading group rotation times for students to access phonics software. These computers were not normally connected to any form of printing/scanning devices.

Practical issues of IWB use were observed during periods of observation in Declan’s classroom. These practical issues included text on the IWB being too high for students to reach and manipulate, as well as the IWB being overloaded with too many high-quality digital images. Such an issue caused a significant delay when manipulating the photographs on the IWB screen, resulting in the manipulation of photographs to be too difficult for students.

Declan also had two whiteboards in his classroom. The first whiteboard was fixed on the wall to the left of the IWB. It was not used during the four observational periods examined in this inquiry and Declan explained that he only used it for administration purposes (i.e., he used it as a place to store students’ notes using magnets). The other whiteboard was an easel whiteboard, positioned to the left of the IWB and in front of the fixed whiteboard. Declan’s chair separated this whiteboard from the IWB. This whiteboard was briefly used during the four observational periods as a place to store and present lesson materials (such as the day’s timeline and the current sounds/phonics book).

5.15 The Activities

Over a one-week period, four periods of observation were conducted in Declan’s classroom. These were scheduled at times identified by Declan within the class’s daily literacy session (see Table 4.4). Three pedagogical activities supported by the IWB were identified in the observations by the researcher. An overview of these is presented in Table 5.3.
Table 5.3
Overview of Declan’s activities

<table>
<thead>
<tr>
<th>Activity</th>
<th>Name of Activity</th>
<th>Movements within the Activity</th>
<th>Observation/Duration</th>
</tr>
</thead>
</table>
| 1        | Producing texts (recounts) | • Constructing short personal recounts (30 min)  
• Recounting an unfamiliar narrative (28 min)  
• Recounting events from a class excursion (20 min) | 1, 2, 3  
(1 hr 18 min) |
| 2        | Developing graphological and phonological awareness | • Recognising that words are made up of letters (4 min)  
• Stimulating phonological awareness through singing (16 min)  
• Recognising letters and their sounds (50 min)  
• Using illustrations to assist reading (4 min) | 1, 4  
(1 hr 14 min) |
| 3        | Spelling | • Reviewing an independent task (9 min)  
• Checking in after completing an independent task (20 min) | 3, 4  
(29 min) |

The next sections describe and discuss each of the three activities and their associated movements.

5.15.1 Activity 1: Producing Texts (Recounts)

The teacher’s pedagogical aim in this literacy activity was to engage students in shared writing experiences, with the intention of conveying an idea or message (through the recount text type) (BoS, 1998). The three researcher-identified IWB movements employed to do this were:

1. Constructing short personal recounts (30 min);
2. Recounting an unfamiliar narrative (28 min); and,
3. Recounting events from a class excursion (20 min).

5.15.1.1 Movement 1 – Constructing Short Personal Recounts

The teacher’s goal in this first movement was to prepare students for independent journal writing by jointly constructing a journal entry (about what happened on the weekend) (BoS, 1998; D-D1-9.8.10). An overview of the movement’s sequence, and the key phases within, is presented in Figure 5.48.
Figure 5.48. Declan’s pedagogical sequence in movement one (activity one)

The students were seated on the floor facing the IWB, with the IWB screen displaying a word wall with ‘who’ words, ‘doing’ words and ‘theme/topic’ words. Below the text boxes was the beginning of a sentence ‘On the weekend’. The IWB screen at this time was captured in Figure 5.49.
Additional words were added to each text box. This occurred by Declan asking a student for a ‘who’ word, orally stretching out and spelling each word as a class, before Declan used the cordless mouse and keyboard to type and drag each of the suggested words into the appropriate text box. Declan completed this pedagogical pattern once for the ‘who’ words, twice for the ‘doing’ words and ten times for the ‘topic/theme’. Spelling strategies were discussed as Declan asked the students how to spell each word that was suggested.

Sentence structure then became the focus as a student was selected by Declan to approach the IWB and drag words into the sentence to complete the sentence. Mishaps occurred as the student tried to complete the sentence, including words being too high and words disappearing as they were being dragged. Such issues were overcome by Declan by his use of the cordless mouse to lower words as well as using the mouse to ‘move text to the front’ so words dragged would always be in view. The student continued to drag words into the sentence and Declan also asked the student where he went on the weekend. The student responded, “to Quest-a-con”. Declan typed ‘Quest-a-con’ onto the IWB and used the mouse to drag it into the student’s sentence. Kneeling
in front of the IWB, Declan used the red IWB pen to record the students’ ideas as they elaborated on the sentence by adding additional information and words (see Figure 5.50).

Figure 5.50. Modelling journal writing

Declan further demonstrated sentence structure and the organisation of sentences by turning one sentence into two, using a full stop and removing the ‘and’. Students were asked to complete their own independent journal writing at their desks. The IWB screen was left on for the students to refer to during this time.

5.15.1.3 Movement 2 – Recounting an Unfamiliar Narrative

The teacher’s goal in this second movement was for students to recount an unfamiliar narrative (BoS, 1998; D-D2-10.8.10). An overview of the movement’s sequence, and the key phases within, is presented in Figure 5.51.
Declan introduced the text, in paper-based form, *The Runaway Damper* (by Pat Edwards, 1988) to the class, who were positioned on the floor. An experience on intertextuality occurred as connections between this text and the narrative, ‘The Gingerbread Man’, was made. The front cover, title and author of the text were also discussed before Declan read the text to the class. The IWB screen was turned off during this time.

During the reading of the text, ideas were orally brainstormed as Declan stopped to question students and provide explanations (e.g., what a damper is, what a swagman is, etc.). Once the text was read, Declan used the cordless keyboard to type students’ ideas on the IWB as they reviewed the text and constructed a class recount of the narrative (see Figure 5.52).
Whole-class discussion on text structure (such as heading, beginning, middle and end) as well as content (e.g., content most appropriate to include and in order of events) took place. Declan’s questioning (e.g., what happened then/next) probed and encouraged students’ thoughts and ideas. A general response from the students based on their personal opinions about the narrative (i.e., whether they liked it or not and why/why not) was lastly recorded by Declan on the IWB.

5.15.1.5 Movement 3 – Recounting Events from a Class Excursion

The teacher’s goal in this third movement was to recount events from a class excursion to the local police station, fire station and library (BoS, 1998; D-D3-18.8.10). An overview of the movement’s sequence, and the key phases within, is presented in Figure 5.53.

![Figure 5.53. Declan’s pedagogical sequence in movement three (activity one)](image)

The photographs were displayed on the IWB in two rows of four photographs, with two rows of four (numbered) boxes underneath. Figure 5.54 captures the classroom setting and IWB screen at this time.
The pedagogical pattern of Declan identifying and discussing each of the eight photographs occurred before a whole-class oral recount was constructed. Students were then called upon one at a time to approach the IWB and identify the next photograph in the sequence. Each photograph identified by each student was discussed and, if correct, the photograph was dragged by Declan into the next box. The classroom setup is captured in Figure 5.55.

*Figure 5.54. Photographs from a class excursion*

*Figure 5.55. Ordering photographs from a class excursion*
Once all photographs were sequenced, Declan pointed to each photograph and orally summarised the day’s order of events. Declan then positioned himself to the left of the IWB and asked the students for words that they might need to spell when writing their own recounts. Five words were suggested by the students and recorded in typed form on the IWB screen using the cordless IWB keyboard. The compiled word bank and classroom layout at this time is captured in Figure 5.56.

![Figure 5.56. Creating a word bank to assist independent recount writing](image)

The IWB screen remained for students to view and refer to as they constructed a one-sentence recount about their class excursion in their workbooks.

5.15.1.2 Interpretative Summary of Activity 1

The IWB was used to brainstorm and record students’ thoughts and ideas as they contributed to the joint construction of recounts during the three movements within this activity.
The IWB was central to the three movements and assisted in providing opportunity for students to orally and physically contribute in the joint construction of a number of recount experiences. While the IWB was used as a central point for the three movements, students were also provided opportunity to engage in whole-class discussion (in all three movements), complete independent journal writing (in movement one), engage with a physical text (in movement two) and engage with photographs from real-life experiences (in movement three).

In all three movements, the IWB became a repository where Declan used the IWB to model the structure of a recount in hand-written form (movement one), typed text form (movement one and movement two) or in photographic form (movement three). For example, in movement one, Declan used the IWB as a visual stimulus/support, as vocabulary was stored for the students to refer to at a later time (during independent journal writing when recounting their weekend events). Declan’s use of the IWB in movement one was intended to assist students’ language knowledge through the students’ identification of ‘who’ words, verbs and words that indicate where actions take place during a whole-class activity (i.e., when adding to the word bank). These IWB experiences assisted students’ writing (i.e., producing a recount), as they talked about and listened to a student’s personal experience and had it modelled to them. Further, these experiences assisted students to independently write single-sentence descriptions and short, personal recounts. The creation of such lesson materials allowed the IWB to become a presentational device, as it provided students with additional print and models to use in, and assist with, their writing.

In movement two the IWB was used as a display to present students’ thoughts and ideas, based on the recount of the narrative. During this second movement, students’ reading skills and strategies were promoted as Declan provided opportunities for students to examine the front cover of the text before it was read, as well as recall, retell and discuss parts of the text read to them. Students were also provided the opportunity to respond to the text by expressing personal opinions and feelings of the text (i.e., as to whether they liked or disliked the text) through giving personal opinions about the characters in the text. Students also talked about the use of words such as beginning, middle and end, thus promoting their understanding and recognition of the structure, features and stages of simple recounts.
In the third movement, Declan used the IWB as a visual aid to stimulate students’ recount of their most-recent class excursion. Photographs of the significant events during the excursion promoted students’ contributions to whole-class discussions on shared experiences, assisting them to recount the day in chronological order. The IWBs visual affordance was exploited during this movement, as photographs from an actual class excursion were viewed and arranged as a whole-class experience (Labbo et al., 2002). Oral responses were encouraged through Declan’s questioning of recount structure, such as past tense, beginning, middle and end, thus allowing the students opportunity to recognise the stages in a simple recount. The digital language experience was also used in connection with modelled writing (as Declan typed words on the IWB screen) as well as in connection with a follow-up experience, where students were required to complete an independent recount writing task (Labbo et al., 2002).

Although direct manipulations with the IWB screen during these three movements were primarily done by Declan (either via finger, cordless mouse and/or cordless keyboard), students’ engagement in jointly constructing a recount was supported through Declan’s continuous questioning and the continuous references he made to the visual, stored information gathered on the IWB. Interactivity occurred between Declan, the students and the IWB as students’ thoughts and ideas were materialised on the IWB screen, thus supporting literacy teaching and learning during these three movements. Declan’s choice to interact with the IWB via the cordless mouse and keyboard meant that he was not getting in the way of the students’ view of the IWB or casting a shadow on the IWB screen. Using the mouse and keyboard was also an easier way to type and immediately record and present information onto the IWB. He was also able to face the students while constructing a text on the IWB, thus promoting student-centred learning. Although Declan was the only one who directly manipulated objects on the IWB during the third movement, the rearranging of photographs and the writing of words were all based on and in accordance with the students’ responses. Although the students did not manipulate objects on the IWB, they appeared to cognitively interact with the IWB by viewing, contributing and thinking, and appeared engaged in the experience.

Declan was efficiently able to access and navigate around the IWB technology and demonstrated to be a proficient user of IWB technology, especially when glitches with the technology occurred. For example, in the first movement text displayed on the IWB
was too high for the student to physically reach, however, Declan used the cordless mouse to lower the text for the student to drag (from one place to another on the IWB screen), thus overcoming this issue and providing a successful environment for the joint construction of a recount to occur. In the third movement, the IWB’s delay in moving photographs on the screen meant that Declan physically moved the photographs, as it was too difficult for the students to do. This did not appear to impact on students’ involvement within the movement, for interactivity was well supported through Declan’s questioning and whole-class discussion throughout the entire movement.

5.15.2 Activity 2: Developing Graphological and Phonological Awareness

The teacher’s pedagogical aim of this literacy activity was to engage students in shared reading and writing experiences, with the intention of promoting their recognition of letters and their sounds (i.e., graphological and phonological awareness) (BoS, 1998). The four researcher-identified IWB movements employed to do this were:

1. Recognising that words are made up of letters (4 min);
2. Stimulating phonological awareness through singing (16 min);
3. Recognising letters and their sounds (50 min); and,
4. Using illustrations to assist reading (4 min).

5.15.2.3 Movement 1 – Recognising that Words are Made up of Letters

The teacher’s goal in this first movement was for students to recognise that words are made up of letters (BoS, 1998; D-D1-9.8.10). An overview of the movement’s sequence, and the key phases within, is presented in Figure 5.57.
The IWB Notebook screen titled, ‘The x-ray machine’, displayed three pictures around a square. As a class, the function and purpose of an x-ray machine was discussed, with Declan explaining that the square on the IWB is a special spelling x-ray machine. After providing detailed explanation of how the IWB activity worked (i.e., when you drag one of the pictures into the x-ray machine, the word of the picture appeared underneath the picture), a student was selected by Declan to identify one of the pictures on the IWB. The student responded verbally, ‘box’ and as a class they stretched out the word ‘box’. before the student spelt the word ‘box’ and dragged the ‘box’ picture into the x-ray machine. The word ‘box’ appeared under the picture of a box before the student dragged the box picture back out of the x-ray machine to where it was originally located. Figure 5.58 captures the classroom setup during this x-ray machine exercise.

Figure 5.57. Declan’s pedagogical sequence in movement one (activity two)

Figure 5.58. Using the interactive whiteboard x-ray machine to identify words
The pedagogical pattern was repeated two more times as two other students had a turn at moving the other two pictures (one at a time) in and out of the x-ray machine. A class discussion on the word, the sounds in the word and the spelling of the word took place for each of the three pictures.

5.15.2.11 Movement 2 – Stimulating Phonological Awareness through Singing

The teacher’s goal in this second movement was to stimulate students’ phonological awareness through singing (BoS, 1998; D-D1-9.8.10). An overview of the movement’s sequence, and the key phases within, is presented in Figure 5.59.

![Diagram](image)

*Figure 5.59. Declan’s pedagogical sequence in movement two (activity two)*

The ‘x’ song was displayed on the IWB, which was a song on the ‘Letter TV’ software, located on the school’s Intranet. Students were positioned on the floor as a whole class and, as the song played, the students sang along. Declan then asked the students if they could see any letter ‘x’ sounds, before selecting a student to underline a letter ‘x’ sound, using a red IWB pen (see Figure 5.60).
The pedagogical pattern was repeated as Declan chose ten students to approach the IWB one at a time and underline letter ‘x’ sounds using a red IWB pen. Once all letter ‘x’ sounds were underlined, Declan exaggerated the letter ‘x’ sounds and emphasised the repetition as he re-read the song’s lyrics to the class.

5.15.2.7 Movement 3 – Recognising Letters and their Sounds

The teacher’s goal in this third movement was for students to recognise letters and their sounds (BoS, 1998; D-D4-19.8.10). An overview of the movement’s sequence, and the key phases within, is presented in Figure 5.61.
This movement took place during weekly reading group time as a pair of students from each reading group was selected by Declan to interact with the Jolly Sounds program sourced from the school’s Intranet. The Jolly Sounds program presented an interactive alphabet/sounds activity where students picked a letter and completed activities based on that letter (e.g., find all the ‘b’s, trace letter ‘c’, etc.). Declan did not demonstrate the IWB activity, as the students had used this IWB activity many times before (D-D4-19.8.10). Figure 5.62 captures two sets of students interacting with the IWB Jolly Sounds program.

![Figure 5.62. Students interacting with the Jolly Sounds program](image)

The other members of the IWB Jolly Sounds program group used the class computers to complete exactly the same alphabet/sounds activity. The implementation of the activity was exactly the same on the IWB as it was on the class computers, with the only difference being the ability of students to manipulate objects directly on the IWB screen, as opposed to having to use a mouse and keyboard on the computers. The students worked independently or in pairs at the computers, depending on the number of students in their group.

In their groups, the students rotated every 10–13 minutes, with Declan selecting two students from the IWB activity group to use the IWB. During this time, the students using the IWB experienced issues with turn taking and sharing. However, Declan did not intervene at any time.
5.15.2.9 Movement 4 – Using Illustrations to Assist Reading

The teacher’s goal in this fourth movement was for students to use illustrations to assist their reading (BoS, 1998; D-D4-19.8.10). An overview of the movement’s sequence, and the key phases within, is presented in Figure 5.63.

Introducing the pre-prepared, teacher-created IWB spelling magnifying glass resource to the whole class

Selecting students to identify a picture on the IWB resource and stretching out the word and its sounds and spelling it with Declan’s assistance

Revealing the label of the picture by dragging the magnifying glass over the text box as a whole class

The identification of a picture and revealing of the label (using the magnifying glass) was repeated for each of the other four pictures

*Figure 5.63. Declan’s pedagogical sequence in movement four (activity two)*

The students sat on the floor facing the IWB, which displayed a Notebook screen with five pictures on it and a text box below each of the pictures. A picture of a magnifying glass was also on the screen. Declan selected a student to approach the IWB, orally identify a picture and, with Declan’s assistance, stretch out the word and spell it. The student then used her finger to drag the magnifying glass over the picture’s text box to see if the word was spelt correctly. The word for the picture appeared in the text box, as captured in Figure 5.64.
The pedagogical pattern of Declan selecting a student, the student’s identification of the picture and movement of the magnifying glass took place another four times until all pictures and their labels were revealed.

5.15.2.4 Interpretative Summary of Activity 2

In all four movements, the IWB was used to engage students in a number of shared reading and writing experiences.

The IWB was used as an audio stimulus (i.e., in movement two and movement three) and visual stimulus (i.e., in all four movements) to promote students’ phonological awareness. For example, in movement one students were able to recognise that words are made up of letters as they heard and articulated sound segments in words through the opportunity to identify certain letters and sounds, whilst also being provided opportunity to stretch out and spell words to label pictures presented on the IWB. In movement two, students were able to participate in the singing of a song with reoccurring language patterns. The IWB was used to display lyrics of a song and as an
audio device (to play the song). In the third movement the IWB was used as a place to present an external-sourced phonics learning object, where students were required to navigate (in pairs) through the software, completing tasks on the way. It was also during the engagement with the Jolly Sounds program on the IWB that students were provided opportunity to read labels accompanying pictures, use illustrations to assist reading, recognise spoken words with the same sound or given sound, recognise that words are made up of letters and hear and articulate sound segments in words as they navigated through sections of the IWB software. In the fourth movement Declan used a teacher-created Notebook experience to provide students (as a whole class) with opportunities to use illustrations to assist with reading. Students’ talking and listening skills were supported as they manipulated objects on the IWB screen, which required them to interpret and carry out simple one-step instructions (from Declan). Opportunities to support students’ reading skills and strategies were provided and included using illustrations to assist reading (i.e., when identifying and labelling pictures, as well as articulating sound segments in words, whilst stretching out and spelling the labels of the pictures identified).

More specifically, the use of an external site in the third movement (Jolly Sounds program) demonstrated to bring an element of community to the classroom. Students participated in partner activity, with only two students using and interacting with the IWB at any given time, as well as listened and responded to computerised instruction, whilst engaging with the IWB experience. It was through such an experience that students were also able to acquire and develop their technological skills and understandings, as they navigated through the phonics software. Further, the external site (i.e., though computerised instruction) operated as a guiding framework for the experience.

The IWB was central in all four movements, as information presented on the IWB was manipulated, whether it was through dragging and dropping text (i.e., movements one, three and four) or whether it was through using the IWB pen to identify specific text (i.e., movement two). For example, in the first movement, the IWBs affordances to drag and drop images into an x-ray machine, expose text and be provided with immediate feedback by revealing the word label in the x-ray machine were utilised within this teacher-created IWB resource. The affordances of IWB technology (e.g., drag and drop,
Immediate feedback, navigation through software) were also utilised through the students’ use of the software during the third movement. In the fourth movement, the IWBs affordances to drag and drop the magnifying glass over a label, reveal text and be provided with immediate feedback by revealing the word label were also utilised within the teacher-created IWB resource. Specific text was identified in the third movement as the students were provided with opportunity to manipulate the IWB screen by following teacher instructions and identifying (by underlining) specific text. Interactivity between the teacher, the students and the IWB was supported during the manipulation of text on the IWB during all four movements.

5.15.3 Activity 3: Spelling

The teacher’s pedagogical aim in this literacy activity was to engage students in a whole-class spelling experience to encourage them to vocalise words when trying to spell them, as well as carefully listen to the sounds in words and trying to write them accurately in a sequence (BoS, 1998). The two researcher-identified IWB movements employed to do this were:

1. Reviewing an independent task (9 min); and,
2. Checking in after completing an independent task (20 min).

5.15.3.3 Movement 1 – Reviewing an Independent Task

The teacher’s goal in this first movement was for students to review an independent task (BoS, 1998; D-D3-18.8.10). An overview of the movement’s sequence, and the key phases within, is presented in Figure 5.65.
Students were seated at their desks following the completion of the first side of a blending (spelling) worksheet. The IWB displayed a scanned image of the worksheet. Declan asked for the answer, the students called out the answer and as a class they stretched out the answer (word), while Declan recorded the response in the appropriate space on the IWB worksheet. This pedagogical pattern was repeated four times for each of the four labels presented on the worksheet. The students marked their own worksheets in correlation with

Figure 5.65. Declan’s pedagogical sequence in movement one (activity three)

Figure 5.66. Reviewing an independent task
Declan’s recording of responses on the IWB. The students were then instructed to complete the second side of the sheet.

5.15.3.5 Movement 2 – Checking in after Completing an Independent Task

The teacher’s goal in this second movement was for students to check in after completing an independent task (BoS, 1998; D-D4-19.8.10). An overview of the movement’s sequence, and the key phases within, is presented in Figure 5.67.

While the students were completing the worksheet, Declan typed (using the cordless keyboard) the five sentences from the worksheet on a new Notebook page, putting text boxes around each of the sentences. Using the red IWB pen, Declan wrote the five missing words in the sentences to form a word bank, before using his finger to convert each of these words to foundation-style writing. Declan then used the option to move all the sentences to ‘the back’ so that when the words were dragged into the sentences, they were in front of the sentence text boxes, so the words could be seen. Figure 5.68 captures Declan creating lesson material while students complete an independent task.
Once Declan completed constructing the lesson material, students were invited to the floor. When all students were seated and settled on the floor, Declan read through the five sentences before providing an explanation of the word bank. The first sentence was completed by Declan reading the sentence, students orally identifying the missing word in the sentence and Declan selecting a student to come to approach the IWB, locate the missing word in the word bank before using their finger to drag it into the sentence (see Figure 5.69).
The pedagogical pattern (i.e., Declan reading the sentence, students orally identifying the missing word in the sentence, Declan selecting a student to approach the IWB and student locating the missing word in the word bank before using their finger to drag it into the sentence) was repeated another four times until all sentences were completed on the IWB.

5.15.3.4 Interpretative Summary of Activity 3

In both these movements the IWB was used to display students’ responses whilst reviewing an independent task (spelling sheets).

The IWB was the central focus of both whole-class movements. For example, in movement one, Declan led the students to review their independent task on the IWB as a whole class. Declan used the IWB as a display tool to display a scanned copy of the students’ independent task. It was with this scanned image that Declan was able to explicitly demonstrate and review the completing of such a task. The students were able to clearly see the scanned image and the completing of the task, and independently
review their own work. Thus, the IWB was used as a teacher-directed display tool during this entire movement. Similarly, in the second movement, the IWB was used by Declan as a display tool to check students’ understandings of a worksheet just completed. Tasks from the worksheet were presented on the IWB and, as a whole-class experience, were completed with Declan providing further questioning and explanations to the students. Thus, in both movements, the IWB was used as a space to display the task and record information (in order to complete the task), whether it was in written form (in the first instance) or using a pre-prepared word bank (in the second instance) on the IWB.

Declan demonstrated to be a proficient user of IWB technology as he was able to display scanned images on the IWB screen (movement one) and create an IWB experience while the students completed an independent task (movement two). In the first movement, Declan was the only one that physically manipulated objects on the IWB, with students sharing verbal responses as they viewed the task being completed. However, in the second movement, students shared their responses by dragging and dropping words from a word bank into the sentences to complete the teacher-created IWB activity.

Pedagogical patterns were repeated in both movements within this activity. Efficiency and momentum appeared to remain through consistent actions to complete the IWB experience in each movement. Thus, the IWB demonstrated to be a guiding framework for the movements. However, through such pedagogical patterns (e.g., in movement one where Declan asked for the word, students orally provided the word, word was stretched out by students and Declan recorded the word) teacher-directed teaching and learning appeared somewhat evident.
5.16 **SUMMARY OF DECLAN’S CASE**

### 5.16.1 PEDAGOGICAL DESIGN

#### 5.16.1.1 Demonstration of Literacy Knowledge
Declan was a mid-career teacher who showed passion for IWB technology use within his daily classroom practices. Through the content presented and the reasoning for incorporating such content, Declan demonstrated a sound understanding of literacy. His enthusiasm for IWB technology was apparent through his IWB expertise and the frequency of his IWB use. Thus, the inclusion and subsequent use of IWB technology within Declan’s school has seen IWB use become an important part of Declan’s whole school’s operation as well as his daily classroom operation.

#### 5.16.1.2 Demonstration of a Proficient Interactive Whiteboard user
Declan had a Kindergarten (Early Stage 1) class and he predominantly used the IWB during whole-class teaching and learning experiences. There was only one time when the students used the IWB in pairs and independent of Declan (D-A2-M3). This paired instance was during reading group time and through the use of phonics software, familiar to all students in the class.

Declan’s IWB lesson materials were mainly teacher created, with only a select few being externally sourced resources (e.g., D-A2-M2; M3). On occasions, IWB lesson materials were created during observational periods, while students completed independent tasks (e.g., D-A3-M2).

Declan’s utilisation of the variety of functions and affordances of IWB technology was observed within the identified activities. Functions and affordances of IWB technology frequently used by Declan included drag and drop of text and/or images (e.g., D-A1-M1, M3; D-A2-M1, M4), the retrieval of lesson materials and resources (e.g., D-A1-M1, M3), and the revealing of hidden text, which led to immediate feedback (e.g., D-A2-M1, M4). Such affordances were evident in both teacher-created IWB resources and externally sourced IWB resources (such as the Jolly Sounds software).
Declan’s frequent use of the cordless mouse and keyboard assisted his student-centred pedagogical practices. Through these accessories, Declan was able to complete a whole-class recount (i.e., by ordering photographs) (D-A1-M3) as well as present text (i.e., whole-class text creations) on the IWB screen (D-A1-M2), while he was sitting and facing the students (as opposed to having his back to the students). Using the cordless mouse and keyboard was also practical in the sense that there was no shadow cast on the IWB screen (Smith, 2001; Walker, 2003), the text was immediately legible (as it was in typed form) and Declan was proficient at typing (i.e., he could type quicker than he could write on the IWB).

Practical and technical issues of IWB use were evident during Declan’s identified activities. For example, in one instance, and consistent with Tameside MBC (2003), the text was placed too high for students to reach (D-A1-M1) while, in another instance, the photographs would not move smoothly when dragged by students (D-A1-M3), with the IWB drag and drop feature being difficult to operate (Canterbury Christ Church University College, 2003). Such instances were efficiently overcome by Declan using the cordless mouse to lower the text for the student to reach and using the mouse to move the photographs (rather than using a finger on the screen).

5.16.2 DELIVERY OF LITERACY LEARNING EXPERIENCES

5.16.2.1 The Interactive Whiteboard as a Focal Point

The IWB appeared a focal point within the three activities and their corresponding movements. Further, Declan’s use of the IWB within the three IWB activities and their associated movements demonstrated to cater for a variety of student learning styles, particularly oral, visual and tactile learners. For example, in activity one the IWB was central to the three movements and assisted in providing opportunity for students to orally and physically contribute in the joint construction of a number of recount experiences. In activity two the IWB was used as an audio stimulus and visual stimulus to promote students’ phonological awareness. For example, in activity two, movement two, students were able to participate in the singing of a song with reoccurring language patterns. The IWB was used to display lyrics of a song and as an audio device (to play the song). In the third movement the IWB was used as a place to present an externally sourced phonics learning object, where students were required to navigate (in pairs)
through the software, completing tasks on the way. Thus, the IWB as a focal point was facilitated through its use and ability to cater for a variety of diverse learning styles.

5.16.2.2 The Interactive Whiteboard as a Repository

Declan used the IWB as a repository in connection with text-based experiences and letter/sound experiences (see Table 5.3). The visual representation of students’ thoughts and ideas was frequently used by Declan, particularly in the first activity. For example, in the third movement (activity one), Declan used the IWB as a visual aid to stimulate students’ recount of their most-recent class excursion. Photographs of the significant events during the excursion promoted students’ contributions to whole-class discussions on shared experiences, assisting them to recount the day in chronological order. The IWB’s visual affordance was exploited during this movement, as photographs from an actual class excursion were viewed and arranged as a whole-class experience (Labbo et al., 2002). Oral responses were encouraged through Declan’s questioning of recount structure, such as past tense, beginning, middle and end, thus allowing the students opportunity to recognise the critical stages in a simple recount. The digital language experience was also used in connection with modelled writing (as Declan typed words on the IWB screen) as well as in connection with a follow-up experience, where students were required to complete an independent recount writing task (Labbo et al., 2002). In general, Declan’s use of the IWB’s large screen and large pens facilitated the young students’ ability to present and record letters/words on the IWB for whole-class display. Whether it was Declan and/or the students who wrote on the IWB, such display practices facilitated joint discussion between Declan and the students, thus leading to meaning construction. As the IWB was used in a way that is flexible, generative and responsive to individual students and contexts, the use of the IWB in the learning community supported the co-construction of knowledge (Miller & Glover, 2002).

5.16.2.3 The Interactive Whiteboard as a Guiding Framework

The IWB as a guiding framework was a common practice observed in Declan’s literacy classroom. For example, in activity two (movement three) the use of an external site (Jolly Sounds program) demonstrated to bring an element of community to the classroom. Students participated in partner activity, with only two students using and
interacting with the IWB at any given time, as well as listened and responded to computerised instruction, whilst engaging with the IWB experience. It was through such an experience that the external site (i.e., though computerised instruction) operated as a guiding framework for the experience. Another example of the use of the IWB as a guiding framework was where pedagogical patterns were repeated in both movements within the third activity. Efficiency and momentum appeared to remain through consistent actions to complete the IWB experience in each movement. Thus, the IWB demonstrated to be a guiding framework for the movements. Such experiences, in general, positively promoted the IWB as a guiding framework, however, through such repetitive pedagogical patterns, the IWB (at times) seemed to limit and restrict the literacy learning experience.

5.17 CONCLUSION
Data collected from three teacher participants were presented to examine the ways that three K–2 teachers (from three different regions of NSW) used IWB technology in connection with their literacy-based pedagogical practices.

Individual case studies were developed to capture the perspectives and experiences of the three participants: Gabby, Kaitlyn and Declan. The reporting of each of the three cases were arranged according to the individual participants’ school, their teaching experiences, their classroom and their professional teaching practices. Each case described the K–2 teachers’ use of IWBs within their literacy-based teaching and learning experiences. Analysis of the collected data was incorporated within each of the three participant cases through interpretive summaries of literacy activities as well as through a summary of each of the three participant cases. While there are similarities and difference across the cases, it would be a simplification of the contextual bounds of the research sites and participants to provide generalisation across the cases. However, each case does reveal important considerations which are summarised.

Gabby, an experienced later-career teacher, demonstrated confidence with both literacy pedagogy and IWB technologies. Throughout the reporting of her case, clear description was provided of how she used IWB technologies to support her literacy teaching and
learning. In Gabby’s classroom the IWB was central to gathering the class together and to structure the literacy experiences. In particular, she used the IWB consistently as a visual stimulus, a way to facilitate discussion, a tool to record student learning and a repository to enable previous lessons to be recalled. Gabby’s use of the IWB supported her and her students to co-construct literacy knowledge in whole class experiences.

Kaitlyn, a mid-career teacher, also demonstrated confidence with both literacy pedagogy and IWB technologies. Throughout Kaitlyn’s case, description of her use of the IWB during both whole class and small group times was presented. Consistent throughout her use of the IWB was her incorporation of a range of resources including her own lesson ideas, Internet sites and commercial software. In particular, she used the IWB as a guiding framework for her lessons; it became a visual stimulus and a repository for learning objects and teacher-created resources.

Declan, also a mid-career teacher, also demonstrated confidence with both IWB technologies and literacy pedagogy. Throughout Declan’s case, description of his use of the IWB during whole class and a paired experience was presented. Interestingly, this paired experience was the only example captured where the IWB was used by the students without the direct support of the teacher. Declan was observed to use the IWB as a visual stimulus, a way to create written joint constructions with the students and as a repository to store lesson materials and work samples.

Within the following and final chapter of this thesis, analysis of the participant cases is drawn upon to make connections between and across cases in order to respond to the framing research questions. Cross-case analysis, informed by Activity Theory, revealed components contributing to effective use of IWB technology for literacy teaching and learning. Such components of effective use of IWB technology for literacy teaching and learning are presented and discussed in connection with the literature to respond to the overarching research question of how K–2 teachers use IWBs in connection with their literacy-based pedagogical practices.
CHAPTER SIX – DISCUSSION, RECOMMENDATIONS AND CONCLUDING COMMENTS
6.1 INTRODUCTION

The purpose of this study was to examine, using Activity Theory (Engeström, 1996) as a conceptual frame, the ways that K–2 teachers use Interactive Whiteboard (IWB) technology in connection with their literacy-based pedagogical practices. One main question with three sub-questions framed the study:

How do primary teachers (K–2) use IWBs in connection with their literacy-based pedagogical practices?
- How are teachers’ use of IWB technology supported within their whole-school and professional contexts?
- How are IWBs incorporated within the pedagogical design and delivery of literacy learning experiences?
- What affordances does IWB technology offer for literacy teaching and learning?

The previous chapter presented the ways that three teacher participants (from three different NSW Department of Education and Training regions) used IWB technology within their K–2 literacy classrooms. Analysis of the collected data was incorporated within each of the three participant cases through interpretative summaries of literacy activities as well as through a summary of each of the three participant cases. This chapter aims to draw on the analysis of the participant cases to make connections between and across cases in order to respond to the framing research questions.

A model of how effective use of IWB technology is achieved in classroom literacy experiences emerged from this analysis and is presented. Components within the model are explicated using Activity Theory as a frame to provide in-depth discussion in responding to the overarching research question of how K–2 teachers use IWBs in connection with their literacy-based pedagogical practices. Such knowledge and understandings presented provide further research to the limited knowledge and understanding of effective IWB practice within K–2 literacy classrooms.

Recommendations for future research directions are also presented and discussed within this chapter, before concluding comments for the thesis in relation to the study’s framing research questions are made.
6.2 A Model of Teachers’ ‘Effective’ Interactive Whiteboard Use in Literacy Classrooms

Cross-case analysis informed by Activity Theory revealed components contributing to ‘effective’ use of IWB technology for literacy teaching and learning. Figure 6.1 provides a representation of the interpretation and analysis of participant data of how ‘effective’ IWB technology use is achieved.

![Diagram of Model of Teachers' Effective Use of Interactive Whiteboard Technology]

*Figure 6.1. Effective use of interactive whiteboard technology for classroom literacy experiences*

Such a model closely aligns with the study’s conceptual framework, Activity Theory (see Figure 3.1). For example, the K–2 teacher’s (the subject) in-depth understanding of the affordances of IWB technology and his/her ability to manipulate these affordances
within his/her literacy teaching practices (manipulation of the tool) must appropriately merge and integrate with that teacher’s sound understanding of literacy development and acquisition, and associated pedagogical practices (the object) within a supportive whole-school and professional context (the community, rules and division of labour) for ‘effective’ use of IWB technology for classroom literacy to occur (the outcome).

In contrast, without sound knowledge and understanding of each of these components and subsequent integration, effective use of IWB technology is not likely to occur.

Pertinent components are encompassed within the main elements presented within the ‘effective’ use of IWB technology for the classroom literacy model. These components contribute to the ‘effective’ use of IWB technology in classroom literacy experiences. A discussion of these pertinent components of this model in connection with data collected from three teacher participants and connections to Activity Theory and literacy teaching and learning (the study’s literature review) is presented in the subsequent sections.

6.2.1 WHOLE-SCHOOL SUPPORT AND PROFESSIONAL CULTURE
Whole-school support and professional culture play a significant role in the effective use of IWB technology within classroom literacy experiences. Pertinent components encompassed within this main element include the expectations of teacher use of IWB technology and reported confidence with IWB technology and teacher training. Such components are further discussed in succeeding sections. This section responds to the first research sub-question, ‘How are teachers’ use of interactive whiteboard technology supported within their whole-school and professional contexts?’

6.2.1.1 Expectations of Teacher use of Interactive Whiteboard Technology
There is clearly an expectation from the whole and wider school community (e.g., other teachers, parents, principals and department personnel) that teachers use IWBs in their classrooms (Smith et al., 2005). Expectations of IWB use in each of the three classrooms and the whole school were considered high, as all principals appeared to value IWB technology within primary school classrooms.
Such values and expectations were evident through the principals’ conscious efforts to install IWB technology in all classrooms within their schools. The number of IWBs installed in the three schools was high and ranged from 32 in Gabby’s 30 teacher school (800 students enrolled), 33 in Kaitlyn’s 30 teacher school (640 students enrolled) and nine in Declan’s eight teacher school (230 students enrolled) (see Table 4.1). All three principals’ justification for their financial commitment and purchasing of IWB technology within their schools was based on their personal views and the vision they held for their schools. Further, the principals’ understanding of ‘vision’ for IWB technology in their schools appeared to be based on the “vision of having one [IWB] in every classroom” (G-DPI-27.8.10).

It is possible that the principals were captivated by the novelty of the technology and the affordances that the IWB might offer, as they were quick to demonstrate that they highly valued IWB technology for the classroom environments. However, as the literature clearly demonstrates, the technology needs to be part of the everyday life of the classroom (Glover & Miller, 2002; Miller & Glover, 2002) and permanent IWB placement in classrooms is critical as “it is only when the full potential [of the IWB] was realised that teaching could be enhanced” (Glover & Miller, 2002, p. 8). Thus, the principals’ visions for permanent acquisition of IWB technology within classroom environments had the potential to successfully integrate such technology into teaching and learning environments and, in turn, enhance student learning.

Regular use of the technology, therefore, was expected by the principals, as well as the school community and wider school community, particularly since a large number of IWBs were purchased and installed through Parent and Community Committee funding. Through the lens of Activity Theory, where all components of an activity system are interdependent, it is apparent that through top-down decision-making of the purchasing and installing of IWB technology, members of the wider school community, such as parents/caregivers and executives, are influencing (through rules and expectations) teachers’ use of IWB technology within their teaching and learning practices.

Similar to other ICTs, the upsurge of IWB technology in primary school settings has resulted in the expectation of major changes in classroom practice and promises of transformation for teachers and their practices. However, expectations placed on
teachers to incorporate IWB technology within their teaching practices can lead to
excessive use of such technology (Thornbury, 2009). This was particularly evident in
Gabby’s literacy classroom, as she used the IWB to conduct a weekly spelling test (G-
A3-M1). Thus, “we [as educational researchers] need to move beyond the notion of
‘promise’ with technology and look to the critical role it plays” (Kervin & Jones, 2009,
p. 11) in an aim to convert such expectations and enthusiasm, generated by the
innovation and uptake of IWB technology within educational settings, into purposeful,
effective and sustainable practice.

More specifically, related to Activity Theory and activity system (see Figure 3.1), rules
are “the explicit and implicit regulations, norms and conventions that constrain actions
and interactions within the activity system” (Engeström, 1993, p. 67) and, as subjects of
the activity system (in this case), teachers are in constant negotiation and reorganisation
of the rules. In this study the rules are not only classified as classroom regulations and
conventions (expected student behaviour, cooperative and collaborative learning), but
are also classified as the reality of IWB use, such as school IWB policies and
regulations, perceived demands, the regulations of maintenance, accessibility, support
and training/professional development. Control of the technology in the activity system
now comes under question as the technology and expectations of use of the technology
has been demonstrated to come from above and from the wider school community, yet
the responsibility for ‘effective’ IWB use within the classroom appears to be solely
placed on the classroom teacher (in this case, the subject of the activity system). As the
components of an activity system are interdependent, teachers, executives and
parents/community need to work in close connection with each other for ‘effective’
IWB use to occur.

The government, school leadership and parents seem to have an integral position in the
purchasing and installation of IWB technology within all three schools. With top-down
decision-making comes pressure to ensure the technology is visible and used regularly.
However, their perceptions of ‘value for money’ can come at a cost, as high
expectations of IWB use are placed onto teachers, without consultation with teachers
and without consideration of their IWB expertise and professional development. As the
integration of ICT (such as IWB technology) within teachers’ pedagogical practices
“requires a careful process of collaboration between teacher and experts” (Hedberg &
Freebody, 2007, p. 7) a conscious effort to provide further and ongoing consultation and communication between the government, school leadership, parents and teachers is deemed necessary. Therefore, it is reasonable to suggest that IWB technology installation and use in classrooms is still controlled by the school community and wider school community. The K–2 teachers under investigation appeared to have little control over the IWB technology placement and use in their classrooms and schools. While these teachers worked with rules and expectations external to their classrooms, they all met the challenge of accommodating IWB technology within their literacy classrooms. Such an issue is discussed in more depth in a later section of this chapter.

6.2.1.2 Reported Confidence with Interactive Whiteboard Technology and Teacher Training

The participant recruitment process involved NSW Department of Education and Training regional directors identifying schools that satisfy the specific criteria. The principals within these schools then identified teachers that satisfy the specific criteria. Such a recruitment process indicated that the principals believed that their teachers were using IWB technology in the most pedagogically appropriate manner. Interestingly, the beliefs that each principal held of the whole-school use of IWB technology closely reflected their beliefs of the teacher (from their school) under investigation. For example, Gabby’s deputy principal believed that Gabby was the most outstanding IWB user and this belief is based on her excitement and enthusiasm toward the technology as well as her diverse IWB experience, such as going overseas. However, although these three principals indicated high beliefs of their teachers’ IWB pedagogical practices, such as the highest interactivity level (pedagogical), their reasoning and justifications for such beliefs indicated otherwise, thus indicating the teachers’ IWB interactivity is at a lower level (technological). As such, how principals define ‘most-effective’ IWB use and inclusion within classroom environments comes under question, for what they perceived as ‘best practice’ may, in fact, reflect interactivity at a lower level(s), that is, Moss et al.’s (2007) initial (technical) and secondary (conceptual) levels of interactivity.

Teacher beliefs in regard to their own IWB implementation within their classrooms closely reflected the beliefs presented by their principals. The three teachers highly
rated their own IWB use on a self-rated scale (1–5), justifying their decisions based on their IWB training and subsequent confidence to use the IWB in their teaching.

However, the teachers were aware of the challenge in making sure they created goal-specific, focused, quality lessons. Such concerns are reflected in a study conducted by Hall and Higgins (2005) that focused on primary school students’ perceptions of IWBs, with findings indicating that there was a need for comprehensive teacher training in the use of the IWB and the need to help promote a more accommodating, shared approach between teachers and students. Hall and Higgins (2005) assert that:

While the technology is clearly engaging from the students’ perspective, there is a concern that any gains in this direction may be lost if the technology is not reliable, if teachers are not adequately trained to use it and perhaps more importantly, if the educational climate militates against increased pupil access to the technology. (p. 114)

Thus, although the executives in the school communities affirmed the teachers’ self-ratings, such high ratings of self-perception were reflective of their technical confidence and were not always converted into rich, pedagogical, literacy learning experiences.

All three teachers’ perceptions of their level of IWB use demonstrate they believed they did not need further training, as they believed their IWB skills were beyond those offered within the training courses. These views support Kennewell and Beauchamp’s (2007) understanding of IWB training:

The current level of integration of IWBs into teachers’ pedagogical knowledge is an achievement which should not be underestimated, but if IWBs are to meet the expectations of policy makers and achieve the claims of practitioners, there may need to be a new wave of professional development in ICT which takes account of the extended list of ICTs features and the need to embed them in teachers’ pedagogical knowledge and reasoning. (p. 240)
Thus, it is reasonable to suggest that access to more-carefully crafted and designed, content-structured teacher training and professional development on the implementation of IWB technology in a more-sophisticated and pedagogical manner would be more useful to teachers such as those in this study.

Regardless of how teachers rated themselves on the self-rating scale, it is apparent that such ratings were based on their high confidence levels, their skills and ability above and beyond those offered at current training courses and their lesson preparation of IWB materials (such as choosing lessons online rather than using one’s own creations). Findings clearly indicate, however, that teacher confidence did not necessarily lead to better practice. It seems reasonable to suggest that teacher ratings and justifications were not based on the pedagogical appropriateness of the use of such technology but, rather, based on the technical advantages and their technical competence with such technology. Such emphasis of the technical components of the tool has the potential to lead to serious implications for classroom practice. Further, misconceptions of the technology and its role in the classroom may cause the IWB to take over the pedagogical objective and outcome of the learning experience, rather than the other way around, with the teacher using the IWB as a tool for teaching and teaching.

All three teachers were continuously supported both within their whole-school and professional network contexts, but to differing degrees. Some trends in the data are apparent. For example, the trend in IWB installation and adoption shows that during the initial stages, hands-on, face-to-face and group training and sharing times are more frequent. Over time, such sharing times were replaced by individual support by the school’s computer/technical coordinator, whether it is face-to-face or online. These trends were apparent across all three teacher participant schools.

Another trend across all three teacher participant schools suggests that, as teachers become technologically efficient in their use of IWB, the training and development courses offered outside the school (such as the Department of Education and Training IWB professional development courses) did not cater for their increased levels of IWB experience, thus, not assisting with teachers’ IWB professional development. This seemed to result in the teachers not valuing further training and development, thus remaining at this stage of IWB use. As indicated on their self-rated scales of IWB
competency use, the teachers also viewed themselves as competent and highly efficient IWB users.

Another consequence of such basic training, principals and teachers were given the impression that the teachers were using IWB technology in appropriate ways, hence the principals’ beliefs of their school and teacher IWB use and the teachers’ high ratings of their own IWB use. This is understandable because they were comparing themselves to other teachers, especially at training sessions. The training sessions only offer limited content and skills and they felt that if they knew all that, then they knew it all. However, this is not the case. Further training, professional development and exploration on a deeper level of IWB technology and literacy pedagogical practices is necessary, and teachers’ beliefs and understandings are also now in need of changing. Thus, IWB professional development has not caught up to IWB technology access, but it needs to and needs to be more pedagogical focused and provide teachers with knowledge and understandings of how pedagogy can be enhanced through the use of such technology. For example, training and development sessions based on IWB technology use making specific links to syllabus outcomes and indicators (i.e., modelling how to create such resources and offering already made syllabus-focused resources) are deemed necessary. For best IWB literacy-based practices to occur, teachers’ perspectives and views also need to be altered, with teachers gaining a deeper understanding of the most ‘effective’ pedagogical IWB literacy-based practices.

6.2.2 TEACHER UNDERSTANDING OF INTERACTIVE WHITEBOARD TECHNOLOGY

Teacher understanding of IWB technology contributes to the effective use of IWB technology within classroom literacy experiences. Pertinent components encompassed within this main element include access to IWB technology and its accessories, resource availability and the technology affordances and literacy pedagogy these resources represent. Such components are further discussed in subsequent sections.

6.2.2.1 Access to Interactive Whiteboard Technology and Artefacts

All three classrooms were fully equipped with IWB technology, thus providing these teachers with permanent access to IWB technology for their teaching and learning
experiences. During the periods of observation in Gabby’s classroom, a temporary IWB projector was used in place of a permanently fixed short-throw projector. Although disruptions were caused to literacy experiences, Gabby continued to use the IWB as she normally would (G-II-27.8.10). Gabby’s persistence of using IWB technology, even when the technology was disrupting her literacy pedagogy, indicates a degree of reliance on IWB technology within her pedagogical practices.

Reliance on IWB technology needs to be further investigated, as there is a fine line between teachers embracing technology, such as IWB technology that has been ‘lumped’ in their schools and classrooms, and teachers being reliant on such technologies within their daily pedagogical practices. Labbo (2006) states “it is currently the best of times and the worst of times for literacy pedagogy in the educational era of the new electronic, digital and information driven millennium” (p. 200), modern technology (such as IWB technology) demands changes to the nature of literacy (Leu & Kinzer, 2000). Such reliance clearly impacts (in both positive and negative ways) on teachers’ pedagogical practices as they are in a constant pedagogical battle between the pressures of modern technologies and digital literacy, and traditional literacy practices. It is reasonable to suggest, therefore, that IWB technology needs to be permanently accessible by teachers and needs to be fully functioning in order for IWB technology to potentially be most effectively used and incorporated within literacy teaching practices. Teachers need to remain mindful of their reliance upon such technology in their activity system to ensure that IWB technology (or any technology, for that matter) is used as an appropriate tool to support the teaching and learning of literacy curriculum outcomes and expectations (the object in the activity system). Thus, leading to and resulting in improved literacy teaching and learning (the outcome in the activity system).

The supply of IWB accessories demonstrated to be an important part of the teachers’ use of the IWB during their literacy practices and the use of these accessories contributed to the teachers’ effective use of IWB technology. Various IWB accessories were used by all three teachers and included use of the cordless mouse and keyboard and Gabby’s use of recording devices such as a microphone, the IWB screen’s SMART recorder and a camera. Kaitlyn used the cordless mouse and keyboard to access and present literacy experiences (e.g., K-A4-M1) while Declan was observed using the
cordless mouse and keyboard more extensively. For example, Declan used the cordless mouse and keyboard in a variety of ways to include additional text when jointly creating a text on the IWB screen (e.g., D-A1-M1, M2, M3), to construct lesson materials to assist students in checking in after completing an independent task (e.g., D-A3-M2), as well as to efficiently overcome practical issues, such as text positioned too high on the IWB screen for students to access and text disappearing when being dragged on the IWB screen by students (e.g., D-A1-M1).

Gabby’s use of a variety of recording devices demonstrated her ability to exploit the technology to record and store lesson creations and materials in diverse ways. For example, the microphone was used (prior to a learning experience) to create lesson materials (e.g., G-A3-M1), a ‘Flip’ digital camera was used to record students’ role-plays (G-A2-M2) and the IWB screen as an audio recording device was used to record and play back students’ retelling of a story (e.g., G-A2-M3). Learning objects were created, as these resources were digitally created, saved and stored, thus allowing them to be reusable to reinforce and further explore concepts (e.g., the critiquing of storytelling techniques in G-A2-M3).

The physical presence of IWB technology in the three classrooms demonstrated to have a significant impact on both the classroom layout and the dynamics of the classroom setting. This is observed to be due to the IWB being a focal point in the majority of literacy experiences within the three classrooms under observation. Instances where the IWB was central to the learning experience were common and occurred more often than not. For example, the IWB was central in Kaitlyn’s classroom as she presented Letterland experiences to the class (K-A1-M1, M2) as well as during a whole-class experience when labelling the parts of a snail (K-A4-M1). Examples of times when the IWB was central in Declan’s literacy classroom included when whole-class production of texts took place (D-A1-M1, M2, M3). The IWB was also a central part of Gabby’s literacy classroom, whether it was to present materials to the whole class (e.g., G-A2-M3), use the IWB as a background (e.g., G-A2-M2) or use the IWB as a place to record students’ responses and create lesson materials (e.g., G-A1-M1). Thus, the IWB was a central part of the classrooms under investigation throughout their daily literacy sessions and classroom practices.
There was one particular instance in Declan’s classroom where he used the IWB as a focal point and visual aid to stimulate students’ recount of their most recent class excursion (D-A1-M3). Photographs of the significant events during the excursion promoted students’ contributions to whole-class discussions on shared experiences, assisting them to recount the day in chronological order. The IWB’s visual affordance was exploited during this movement as photographs from an actual class excursion were viewed and arranged as a whole-class experience. Oral responses were encouraged through Declan’s questioning of recount structure, such as past tense, beginning, middle and end, thus allowing the students opportunity to recognise the stages in a simple recount. The digital language experience was also used in connection with modelled writing (as Declan typed words on the IWB screen) as well as in connection with a follow-up experience, where students were required to complete an independent recount writing task (Labbo et al., 2002). As meaning is constructed through shared experiences within this literacy teaching and learning experience, interactions and dialogue between Declan, the students and the IWB played a mediational role between these participants, leading to further learning (Daniels, 2001). Thus, joint construction was evident as a fundamental tool for meaning construction (Vygotsky, 1978). Further, from a social constructivist perspective, students’ interactions with their social environment (such as the wider school environment, the classroom and specific experiences within the classroom) are critical and must not be discounted (Airasian & Walsh, 1997).

There was one particular instance that emphasised the IWB as a focal point to achieve ‘effective’ literacy teaching and learning in Gabby’s literacy classroom. This instance occurred in Gabby’s first activity where whole-class clarification of the meaning of a text occurred through the co-construction of an illustration, in order to create a shared visual representation of the setting of the text (G-A1-M2). Through Gabby’s effective use of the IWB’s large display, the community became Gabby and the students, as they learnt together and from each other (McCabe & Emery, 2003; Miller & Glover, 2002). This was facilitated as students’ opportunity to take control and responsibility of their own learning was promoted, thus “expand[ing] possibilities for collaboration and construction of knowledge” (McCormack & Ward, 2003, p. 82). During this time, students were invited by Gabby to interact with the text as they made connections between their own prior knowledge and the text as well as identified significant information within the text (Harris et al., 2006). The IWB enabled the students to learn
through “actively exploring and making sense of the world by using their bodies, including active exploration of all the senses” (Ministry of Education, 1996, p. 86). At this point, a shift in classroom layout and classroom dynamics was apparent, as the IWB was emphasised as a meeting point where the teacher’s literacy pedagogy and students’ literacy learning came together to co-construct knowledge and understanding, with this social product created by the processes of conversation, discussion and negotiation (Confrey, 1995; Ernest, 1995; Woo & Reeves, 2007). Further, it is through the IWB’s collaborative abilities that student-centred practices were evident and well supported. However, such instances of student-centred practices were not evident across all activities observed in the classrooms under investigation.

6.2.2.2 Resource Availability and the Technology Affordances and Literacy Pedagogy these Resources Represent

The volume of resources that can be accessed via IWB technology is almost infinite as an IWB allows users to interact with a wide range of resources such as video, audio, text and images, access the Internet, access the school’s Intranet and video conference as well as write, type or draw on the board and then save, alter or print images/documents. During the periods of classroom observation, resources and programs were accessed and retrieved via the Internet (see K-A4-M1 for an example of the retrieval of a YouTube clip from the Internet), the school’s Intranet (see D-A2-M2, M3 for an example of the retrieval of software from the school’s Intranet) and the IWB’s own storage (see G-A2-M3 for an example of the retrieval of past lesson creations). The resources accessed were a variety of software programs, teacher-created resources and past lesson creations.

The majority of these digital resources retrieved can also be classified as learning objects as they were presented in a multimedia format and consisted of one or a combination of components such as sound, graphic, text, video and animation (Miers, 2005). Such resources appeared to cater for a variety of learning styles, as the IWB and its associated resources provide opportunity for physical, audio and visual preferred learning styles. Retrieval of lesson materials appeared to be quick, as all three teachers demonstrated an ability to efficiently navigate around the IWB software and retrieve relevant lesson materials as required. The ability to immediately access unlimited
resources has changed the nature of teaching, as resources are at hand and available upon teachers’ and/or students’ request. Further, the ability to retrieve multimodal resources and provide opportunity to cater for diverse learning styles appeared to assist in engaging students (Wall et al., 2005) and capturing and embracing students’ attention (Beeland, 2002) much more strongly than other classroom resources (Smith et al., 2005). Thus, students’ contributions and interactions with the literacy experiences presented were further supported and facilitated.

The IWB was used as a repository where lesson materials could be stored and retrieved when needed. The IWB as a repository was a common practice observed in all three classrooms. For example, Gabby used her IWB as a repository through her literacy activities and movements, whether it be to record keywords from whole-class discussions, construct a whole-class illustration of the setting of a text or record, in audio form, students’ retelling of a text. Kaitlyn, too, frequently used the IWB as a repository and examples of times when this occurred included identifying three-letter words and identifying words that rhyme. Such materials were sourced and retrieved from Kaitlyn’s own IWB resource storage, and the retrieval, recording and storing of information and students’ responses (as a result of discussion or questioning from Kaitlyn) allowed material to be immediately presented on the IWB for all to see and use. Such design features, functions and capabilities of IWB technology are commonly acknowledged within literature (e.g., Glover et al., 2005; Hall & Higgins, 2005; Hodge & Anderson, 2007; Kennewell & Higgins, 2007).

Similar to Gabby and Kaitlyn, Declan’s use of the IWB as a repository was frequent. Declan utilised the IWB’s large display to provide visual representations of students’ thoughts and ideas, thus providing a visual aid to stimulate students’ thoughts and responses in whole-class construction of a text. Use of the IWB’s visual capability to create lesson materials that are attractive to both teachers and students (Ball, 2003; Kennewell, 2004), better engage students (Wall et al., 2005) and capture and embrace students’ attention (Beeland, 2002) much more strongly than other classroom resources (Smith et al., 2005) is acknowledged in the literature.

Declan’s use of the IWB’s large screen and large pens facilitated the young students’ ability to present and record letters/words on the IWB for whole-class display. Whether
it was Declan and/or the students who wrote on the IWB, such display practices facilitated joint discussion between Declan and the students, leading to meaning construction. As the IWB was used in a way that is flexible, generative and responsive to individual students and contexts, in the majority of cases, all three teachers use of the IWB as a repository in the learning community provided a clear visual representation of thoughts and ideas to stimulate further discussion and thoughts, thus supporting the co-construction of knowledge (Miller & Glover, 2002). This was achieved through the teacher and students’ ability to contribute information as well as access information, thus promoting pedagogical interactivity.

Easily accessible ready-made resources such as commercially produced phonics programs were used in both Kaitlyn and Declan’s literacy classrooms. Kaitlyn’s use of the phonics software, Letterland, was used during whole-class experiences (K-A1-M1, M2). Declan incorporated two different phonics software programs within his literacy classroom experiences, with the first program being Letter TV, used as a whole-class experience to play and sing a letter song before locating the letter ‘x’ (D-A2-M2). The second phonics program used by Declan was the Jolly Sounds program, used in an unassisted paired situation during weekly reading group time (D-A2-M3). Gabby did not incorporate learning objects of this nature within her literacy teaching during the periods of observation within her classroom. The selection to incorporate commercially produced software brings ‘new’ participants into the classroom activity system (as termed by Activity Theory) at these particular times, as the creators’ (of such software) beliefs about literacy pedagogy and their awareness of IWB technology affordances come to play. However, when incorporating such software into literacy teaching and learning experiences, teachers need to remain mindful of using the IWB as a tool for literacy teaching and learning, and not the other way around.

IWB learning objects, such as the phonics software used by Kaitlyn and Declan are reusable, meaning that the same learning object can be used in multiple contexts for multiple purposes (Miers, 2005). Such abilities to reuse learning objects are viewed as efficient for literacy teachers, as they are reliable and are able to save time by reusing already constructed IWB literacy lesson materials (whether they personally construct these, share resources within the school community or access such resources online). However, such ability to reuse learning objects can be problematic for the literacy
classroom, as IWB literacy teaching and learning environments are not specifically created for the students’ learning needs in the respective literacy classroom. Consequently, rich literacy environments based on syllabus outcomes and indicators (specific learning objectives) can be unintentionally neglected and overridden by such digital resources (Namuth et al., 2005). Moreover, the ability to reuse literacy-created IWB learning resources has also become increasingly questionable in a climate of curriculum change.

As teachers become more confident and experienced with the functions of IWBs, it is more likely that they will shape their pedagogy in response to the students’ engagement and enjoyment reactions, as they deliberately make decisions about the nature of the learning and interaction patterns they wish to create. Kaitlyn and Declan’s choice to use the selected phonics software could be reflective of Ruster’s (2008) study, where a teacher chose to frequently utilise software packages and web resources, justifying the frequent utilisation of such resources on the students’ positive reaction to these easily accessible resources. However, as teachers are lured in by the IWB’s capability to gain students’ attention, “the technologically impressive features of the IWB can lead to it being used to close down further the possibility of rich communications and interactions in the classroom” (Zevenbergen & Lerman, 2007, p. 861). Thus, teachers need to remain mindful as to what they choose to use the IWB for and how, in an aim to incorporate IWB technology in pedagogically appropriate ways in order to promote (rather than hinder) teaching and learning experiences. Gabby’s literacy pedagogy and IWB proficiency, on the other hand, seems to have moved beyond these forms of phonics resources by simply adopting and adapting IWB resources as she chose to incorporate teacher-created and content-specific resources into her literacy experiences for her students that are more student focused and directed, as opposed to general ‘flashy’, commercially produced phonics programs that are program directed, which Kaitlyn and Declan chose to use and incorporate.

As learning is a socially and culturally situated activity and as students’ experiences with literacy and their evolving understandings of literacy vary according to individual social practices (McNaughton, 1995), teachers are required to comprehend literacy as a social practice that is embedded within daily events and incorporate experiences that involve students interacting with everyday texts (Barton & Hamilton, 2000). Thus, as
students bring to the classroom a history of learning experiences that relate to their previous social and cultural experiences (both in and out of school) (Stage et al., 1998), teachers need to move beyond adoption and adaption of ready-made ‘flashy’ IWB resources and carefully design, create and deliver daily literacy learning experiences that relate to students’ social learning experiences.

6.2.3 TEACHER UNDERSTANDING OF LITERACY PEDAGOGY

Teacher understanding of literacy pedagogy is a critical factor contributing toward the effective use of IWB technology within classroom literacy experiences. Pertinent components encompassed within this main element include tension between IWB use and pedagogical practice, structure and sequence of literacy experiences and teachers’ pedagogical goals. Such components are further discussed in the following sections.

6.2.3.1 Tension between Interactive Whiteboard use and Pedagogical Practice

As previously mentioned, expectations placed on teachers to incorporate IWB technology within their teaching practice can lead to excessive use of such technology (Thornbury, 2009). Further, there is a tendency for technology to be overused to the point that the technology is purposefully incorporated within teaching and learning experiences to replace the physical presence of the teacher (Staley, 2004).

There were two instances during periods of observation within the three classrooms where tensions between the teacher’s IWB use and literacy pedagogical practices were most noticeably evident. One instance was observed in Kaitlyn’s classroom, whereby students requested Kaitlyn read them a narrative, rather than one being read on and via the IWB (K-A3-M2). By requesting Kaitlyn to read rather than the IWB, the students appeared to make assumptions about the teacher’s role in modelled reading in shared experiences and Kaitlyn appeared to undermine her impact on such a learning experience. As a result, questions surrounding the differing quality of interactions between students and the teacher (as questions of relationship between teacher and student are asked), as opposed to the students and the IWB, and what an IWB may lack, are now being asked.
The other instance was observed in Gabby’s spelling classroom, as she withdrew herself from the spelling experience by pre-recording and conducting the spelling test via the IWB (G-A3-M1). The literature indicates that unless IWB technology is viewed more than an aid to efficiency, or an extension device, the potential of the technology may not be realised (McCormick & Scrimshaw, 2001). As the IWB was primarily used as an audio device in this instance, the potential of the technology was not realised, resulting in students’ literacy learning being compromised, as an unfamiliar and disturbing classroom environment was created.

Teachers have a challenging role of carefully crafting literacy teaching and learning experiences. The inclusion and incorporation of IWB technology within these experiences further adds to the challenge. In doing so, teachers need to remain mindful of the significant role they have within their literacy classroom and view the IWB (or any technology for that matter) as a tool to foster literacy teaching and learning and not view the technology as an adequate replacement for their critical role in the literacy teaching and learning experience.

6.2.3.2 Structure and Sequence of Literacy Experiences

The three teachers demonstrated to use the IWB as a guiding framework to assist in the structure and sequence of literacy experiences as they regularly appeared to exploit the IWB’s significant storage and retrieval capabilities by retrieving and presenting pre-prepared lesson materials and learning objects (Glover et al., 2005; Kennewell & Higgins, 2007). Through the retrieval and incorporation of such lesson materials within literacy learning experiences, the IWB was commonly observed being used as a guiding framework within the three classrooms under investigation.

Although all three teachers used the IWB as a guiding framework, Gabby was mostly observed to use her own teacher-created IWB lesson materials and resources as a guiding framework during her literacy teaching. For example, pre-prepared questions were devised in Gabby’s first activity to facilitate students’ predictions about a text as well as guide the literacy experience. It is the questioning and discussion of the text (prior to the text being read) that allowed Gabby to stimulate and support students’ own meaning making. As questions were based on text awareness, more so than text content
(Wilson, 2003), they assisted students in gaining insight into specific aspects such as the way texts are structured (BoS, 1998; Wilson, 2003). Such practices reflected Palincsar and Brown’s (1984, 1989) reciprocal teaching reading technique, as the prediction strategy, involving the combination of the reader’s prior knowledge (acquired from the text as well as the structure of the text), was used in order to make predictions about the text (Doolittle et al., 2006). These practices allowed Gabby to create a supportive environment that encouraged students’ active participation in meaning making, as opposed to Gabby adopting a dominative direct instruction ‘traditional’ role (Baumann, 1988). Such an affordance of IWB technology allows literacy experiences to remain focused and identified goals for literacy activities and movements become achievable.

In both Declan and Kaitlyn’s classrooms, learning objects such as Jolly Sounds (D-A2-M3) and Letterland (K-A1-M1, M2) were evident, and the inclusion of such learning objects demonstrated to provide a framework and bring an element of community to the classroom. The incorporation of learning objects enabled a combination of IWB features such as sound, graphics, text, video and animation to be used, as students were able to efficiently navigate through the familiar IWB software (Miers, 2005) and make contributions to the IWB experience using their finger (Lee & Boyle, 2003). Immediate responses and feedback from students’ physical interactions with the IWB (as they manipulated objects on the screen to complete literacy-based learning experiences) also occurred through the use and incorporation of the software. Through listening and responding to computerised instruction lesson material, students remained focused and on track, within the programmed framework for the experience.

There were three instances where the use of the IWB as a guiding framework appeared to limit the literacy learning experience. In both movements within Declan’s third activity, the use of the IWB as a guiding framework was evident as pedagogical patterns were repeated to review and check in after completing independent tasks (D-A3-M1, M2). Efficiency and momentum appeared to remain through consistent actions to complete the IWB experience in each movement. Such experiences mostly promoted the IWB as a guiding framework in a positive way, however, through such repetitive pedagogical patterns, the IWB seemed to have limited and restricted the literacy learning experience. The use of the IWB as a guiding framework in Gabby’s third activity (G-A3-M1) appeared to restrict her pedagogical practices as it ‘locked’ Gabby
into continuing to conduct the spelling experience in an ineffective manner. Such an instance aligns with findings from Moss et al. (2007) who acknowledge that when used ‘badly’, IWB use reinforces ‘bad’ teaching, and may diminish ‘good’ teaching, with the potential to slow down rather than speed up learning.

Thus, the instances teachers selected to use IWB technology during their literacy teaching and learning experiences become questioned. Such use of IWB technology highlights IWBs as a central part of the classroom as it demonstrates to dominate the workflow. Thus, the structure and sequence of literacy experiences and when IWB technology is most or least appropriate must be carefully considered. Considerations must be made with the awareness of the changing nature of literacy and literate practices (due to IWB technology) both within school and outside school contexts.

6.2.3.3 Teacher’s Pedagogical Goal

Whether identified as mid-career teachers (Kaitlyn and Declan) or as a late-career teacher (Gabby), all three teachers demonstrated to be highly passionate about literacy teaching, IWB technology and the synergies they perceived between them. All three teachers are experienced teachers and demonstrated to present reasonably sound pedagogical practices; all three teachers also demonstrated to have whole-school support. Thus, it is reasonable to suggest that to be a proficient user of IWB technology and to use IWB technology effectively within literacy teaching and learning practices, a strong literacy-based pedagogical knowledge and understanding of literacy learning and development are essential for effective literacy-based pedagogical practices to occur using IWB technology.

This implies an allusion, however, that early-career teachers who may have strong technological understandings but have not established strong pedagogical practices would be less likely to provide optimal literacy-based experiences using IWB technology. The findings of this study strongly suggest that this is a reasonable assumption, and extends the current literature acknowledging that IWB technology cannot singlehandedly promote pedagogy and “can make good teaching even better, but cannot make bad teaching good” (Roblyer, 2006, p. v). It is fair to suggest that the findings extend the current literature surrounding the integration of IWB technology
within teachers’ pedagogical practices and, in particular, argues that a strong literacy-based pedagogical knowledge and understanding of literacy learning and development are essential for effective literacy-based pedagogical practices to occur using IWB technology.

In other words, the findings suggest it is essential that teachers have a strong literacy-based pedagogical knowledge and understanding of literacy learning and development in place, in order for effective literacy-based pedagogical practices to occur using IWB technology. Teachers need to carefully consider how they decide to integrate IWB technology within their sound pedagogical practices. Curriculum/syllabus documents, individual student’s knowledge and preferred teaching and learning environments, as well as the teacher’s own pedagogical attitudes and beliefs, should be closely considered when making such decisions, for technology cannot singlehandedly promote pedagogy. As the integration of ICT within teachers’ pedagogical practices, “requires a careful process of collaboration between teachers and experts, successful experience in teaching with the technologies, and participation in a community that provides continuous support,” (Hedberg & Freebody, 2007, p. 7) the amalgamation of teachers’ literacy expertise and their IWB technology expertise, within a whole-school supportive environment is the optimal pedagogical environment for ‘best’ literacy-based pedagogical practices using IWB technology to occur.

Although the use of IWB technology has been noted to support whole-class teaching (Glover & Miller, 2001), as the user is able to quickly retrieve material for whole-class display, and “manipulate items directly on the IWB” (Kennewell et al., 2008, p. 61), there is a tendency to focus on whole-class experiences rather than small group or independent experiences when using the IWB within the classroom. Instances when the IWB was used during the three literacy classrooms under observation were, in the majority of cases, during whole-class experiences. It was observed that Gabby solely used the IWB during whole-class experiences, while Kaitlyn and Declan predominantly used the IWB during whole-class experiences. There were three occasions where Kaitlyn used the IWB during small group time (K-A1-M3, M4; K-A3-M1) and there was one occasion during classroom observational periods where the IWB was not used during a whole-class experience (D-A2-M3). Such findings demonstrate to support literature surrounding teachers’ uptake of IWB technology, with teachers’ initial use of
IWB technology being the reproduction of existing resources in whole-class delivery, rather than the development of a wider range of pedagogical strategies that are inclusive of IWB use (Kennewell, 2006; Lewin et al., 2009).

Other than these four instances identified in Kaitlyn’s and Declan’s classrooms, the IWB was used during whole-class experiences within the three teachers’ classrooms. The tendency to focus on whole-class experiences using the IWB, rather than small group experiences, is an issue of concern for IWB use and has the potential to inhibit engagement rather than enable it. The responsibility of effective literacy teaching is making the most informed choice of strategy and, from a social constructivist point of view, the teacher has an important role in creating environments that support whole-class, small group and paired interactions that encourage the social construction of knowledge. As a consequence of teachers’ changing pedagogy (due to the inclusion of IWB technology within their classrooms), teachers’ perceptions of their roles within the classroom and literacy teaching and learning experiences will also shift to understand just how critical their role is in facilitating a student-centred teaching and learning environment, thus promoting pedagogical interactivity.

6.3 RECOMMENDATIONS

Several recommendations have been made, based on the inquiry’s findings. These recommendations have been organised into two sections: recommendations for teaching and recommendations for future research, and are presented in the subsequent sections.

6.3.1 RECOMMENDATIONS FOR TEACHING

The findings suggest that research into teacher training is essential. Teacher training, not in terms of the functions of IWB technology, but in terms of connecting the affordances of IWB technology with literacy-based pedagogical practices is necessary. While teachers have been provided with basic IWB training (offered by the NSW Department of Education and Training), this is seen to be too basic and at a technical level, not the pedagogical level these teachers purely require as areas for professional learning. Such training reflects Leu et al.’s (2009) push for technology to be framed as a curriculum issue, rather than focusing on technology in isolation from other subjects.
presented within the primary school curriculum. Further research (and then implementation) into teacher training of IWB technology at a more-advanced level, particularly in relation to most-appropriate pedagogical practices in connection with curriculum demands, are necessary. It is from this more-sophisticated and complex level of professional learning that teachers will be able to gain a more in-depth and accurate understanding of ‘most-effective’ IWB K–2 literacy-based pedagogical practices.

6.3.2 RECOMMENDATIONS FOR FUTURE RESEARCH

The findings clearly indicate that further research and investigation into teachers’ pedagogical practices, in connection with IWB technology as a tool, are essential. In particular, further qualitative and longitudinal studies on teachers’ literacy practices are essential, in an aim to understand the complexities of literacy teaching with such a tool (the IWB). Although this research has revealed how ‘effective’ use of IWB technology occurs in classroom literacy experiences, further research within this area is deemed necessary in order to further inform practitioners, as well as to further inform professional development efforts.

Limited research has been conducted on IWB use in the early school years’ (K–2) classrooms, with the majority of research in this area conducted with older students. Furthermore, limited research has been conducted on IWB use in early school years’ literacy teaching and learning. Thus, in-depth research and further examination into K–2 teachers’ use of IWB technology within their implementation of literacy-based teaching and learning experiences is considered essential.

Activity Theory provided the study with an analytical framework to examine the complexity of particular classroom-based activities. Focusing on the activity as the unit of analysis provided opportunity to examine the IWB as a tool, as it mediated the teaching and learning processes within each social and cultural context. With respect to this research it enabled detailed description of pedagogical practices. However, it is clear there is now a need for deeper theorising of the components of Activity Theory that in turn will further explicate the complex relationships that exist between and among the components of the Activity Theory model in classroom based applications such as this inquiry.
6.4 CONCLUDING COMMENTS

This study examined the ways that three primary teachers used IWB technology in connection with their literacy-based pedagogical practices. Literacy-based teaching and learning experiences were observed from the three K–2 teachers, employed full time within NSW Department of Education and Training public primary schools. Data collected through semi-structured interviews (with the three teachers and their principals), observations of literacy classroom experiences, semi-structured discussions and the collection of teacher-created and student artefacts were collated into three participant cases. Participant cases were then analysed independently and across cases.

This study clearly demonstrates that merely having the IWB in the classroom does not guarantee pedagogically appropriate use of the technology. Teachers need to have a strong understanding and deep knowledge of the affordances of IWB technology. In addition, the use of IWB technology does not compensate for a lack of literacy expertise. Teachers must have a strong understanding and deep knowledge of literacy content, development and acquisition. When teachers’ strong content knowledge and their strong IWB affordance knowledge come together, ‘effective’ pedagogical practices in connection with the use of the IWB can/will occur.

This latter finding is particularly significant for NSW primary school classrooms as more and more teachers are having IWB technology permanently installed in their classrooms with the expectation they will use it effectively. While all teachers in the study were positive about the inclusion of IWBs in their classrooms, and worked hard to use it in ‘effective’ ways, in the most teacher professional development offered was not at the level of the experienced user. Most professional development reported by the teachers was in terms of how to use the IWB and sharing of what is happening in classrooms. These teachers demonstrated the need to be involved in professional development that helped make stronger and more judicious decisions between the affordances of the technology and key content areas within the curriculum (in this research literacy learning expectations for the early years of primary school).

Further consideration of how IWB practices fit within a range of pedagogical practices is another area the study brought to focus. The majority of instances of IWB use
captured in this study were whole-class focuses. While whole class teaching definitely has an important role in classroom teaching, so too do opportunities for small group, partner and independent opportunities. Examples of small group and partner interaction were few in this research and no independent examples were captured. Literacy education, particularly in the early years of primary school, emphasise the need for modelled, guided and independent practices. Given the status these teachers placed on the IWB in their classroom literacy experiences, there is need for further exploration of how IWB might be incorporated with these other classroom organisational patterns and what these might look like for literacy learners.

Thus, for teachers and schools to exploit IWB technology in the most pedagogically appropriate ways, it seems imperative that more-advanced teacher training (focusing on the IWB as a tool to assist literacy teaching) and further research into effective IWB practices within literacy classrooms should continue to be explored.


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Miller, D. J., Averis, D., Door, V., & Glover, D. (2005). *From technology to professional development: How can the use of an interactive whiteboard in initial


Schroeder, R. (2007). Active learning with interactive whiteboards: A literature review and a case study for college freshmen. *Communications in Information Literacy, 1*(2), 64–73.


APPENDIX A – TEACHER INFORMATION SHEET
TEACHER INFORMATION SHEET

Research Project: Examining the ways that primary teachers (K–2) use interactive whiteboards in connection with their literacy-based pedagogical practices

Researcher: Kay Prcevich

I am a PhD student in the Faculty of Education at the University of Wollongong.

Why am I doing this research?
In this research, I wish to work with teachers to explore the ways that they use and integrate interactive whiteboard technology within their daily literacy lessons. The aim of the research is to explore a variety of ways that interactive whiteboard technology is being used in NSW Department of Education and Training K–2 classrooms.

What will it involve?
I hope to recruit a small number of NSW Department of Education and Training primary teachers to assist me in the study. I will ask each teacher to participate in two interviews (30 – 40 mins each), allow me to observe three to five instances of their use of the IWB within her/his literacy classroom and participate in a brief (10 – 20 min) discussion, following each of the three to five observations. Questions will be based on individual teacher’s pedagogical practices. Field notes and digital and audio recordings will be made of the observations. I will also ask the teacher for copies of his/her current classroom program, school literacy policies, IWB work samples and some student work samples produced during the observed literacy periods.

Video/digital and audio recordings of you and your students will be made as part of this study. These recordings will be:

• Collected during interview and observational periods.
• Stored in a locked filing cabinet in the researcher’s (Kay Prcevich) office (23.110) at the University of Wollongong for seven years, and then they will be destroyed.
• Only the researcher (Kay Prcevich) will have access to this data and will see/hear the recordings.
• I will use the recordings to capture you, and how you interact with your students, as well as how you and your students interact with IWB technology.

When will the teachers be involved?
The interviews, classroom observations and discussions will be arranged to take place at negotiated times during now and the end of term three, 2010.

How will the teachers’ rights be respected?
The research is approved by the University of Wollongong and the NSW Department of Education and Training, and will adhere to strict ethical guidelines. For example, schools, teachers and students will not be identified, participants’ interests are respected and raw data kept strictly confidential.

What you should know:
• Your participation in the study will be treated confidentially. In both the analysis and reporting of data, you and your school will not be individually identified.
• As noted on the Consent Form, you are free to withhold consent or withdraw consent to participate at any time without penalty.
• Concerns with the conducting of the research can be addressed to the Complaints Officer, Human Research Ethics Committee, University of Wollongong on 02 42214457

Thank you for your support in assisting with this study. Please do not hesitate to contact me if, at any time, you have questions about the research.

Kay Prcevich
PhD Student, Faculty of Education, University of Wollongong
Phone: +61 2 4221 4277
Email: khp955@uowmail.edu.au
APPENDIX B – TEACHER CONSENT FORM
Appendices

Faculty of Education

TEACHER CONSENT FORM

Research Project: Examining the ways that primary teachers (K–2) use interactive whiteboards in connection with their literacy-based pedagogical practices

Researchers: Kay Preevich

Teacher Consent:
I have been provided with information about this project and have had opportunity to discuss the project with the researcher, Kay Preevich. I understand the researcher is conducting this study as part of her PhD project undertaken at the University of Wollongong.

I have been advised of my involvement with the research and have had opportunity to ask Kay Preevich any questions I may have about the research and my participation.

I understand that my participation in this research is voluntary, I am free to refuse to participate and I am free to withdraw from the research at any time. My refusal to participate or withdrawal of consent will not affect my relationship with the Faculty of Education at the University of Wollongong.

I understand that if I have any enquiries about the research I can contact Kay Preevich (02 4221 4277) or if I have any complaints regarding the manner in which the research is/or has been conducted I can contact the Complaints Officer, Human Ethics Committee, University of Wollongong on 02 42214457.
By signing below I am indicating my consent to participate in the research project conducted by Kay Prcevich as it has been described to me. I understand that questions asked during discussions and semi-structured interviews will be based on my personal pedagogical approaches. I understand that video/audio/photographic records will be made as part of the study. These recordings will take place during interviews, discussions and classroom observations. I understand that the data collected from my participation will be used to describe, categorise and disseminate information regarding the use of interactive whiteboard technology within literacy classrooms.

Name:

Signature:

Date:
APPENDIX C – INFORMATION EMAIL TO REGIONAL DIRECTORS
Dear REGIONAL DIRECTOR,

I am writing to seek your assistance with the identification of schools for the recruitment of participants for my study: *Examining the ways that primary teachers (K–2) use interactive whiteboards in connection with their literacy-based pedagogical practices*. My study has been formally approved by both the University of Wollongong (HE09/385) and The NSW Department of Education and Training – SERAP (2009155).

I am seeking teachers (K–2 teachers in particular) with recognised expertise in literacy, as well as known to use interactive whiteboard technology regularly in their literacy classrooms (i.e., on a daily basis).

Thus, I am asking if you would be able to identify schools known to you to use interactive whiteboard technology (more often than not) across most/all grades. I am anticipating these be schools that have been recognised in some way (i.e., reputation, reports, awards, research, media coverage, additional funding, etc.) to have a high ratio of interactive whiteboard technology in their school as well as are identified (i.e., by reports, awards, research, etc.) to use interactive whiteboard technology extensively and innovatively.

I understand that you would be the most knowledgeable person for this and I was wondering if you would mind taking the time to identify two to three schools/teachers in your region that may satisfy this criterion. Identification of schools simply includes the name of the school. However, any additional information, such as the principal’s name, would also be appreciated.

If you have any further questions or would like a full copy of my research proposal, please do not hesitate to contact me.

I look forward to your reply,

Kay Precelich
PhD Student, Faculty of Education, University of Wollongong
Phone: +61 2 4221 4277
Email:khp955@uowmail.edu.au
APPENDIX D – LETTER TO THE PRINCIPAL
Dear PRINCIPAL,

Thank you for giving approval for your school to participate in my research. As discussed during our last phone conversation, I have sent through an information pack for you, the teacher participant and their students (parents/guardians).

Please find enclosed the following documents:

- Principal Information Sheet
- Teacher Information Sheet
- Teacher Consent Form
- Student Information Sheet
- Student Consent Form

Please refer to individual documents for instructions of the administration of each of these documents.

I look forward to visiting your school and meeting with you, the teacher participant, the students and the general school community.

If, at any time, you have any questions of concerns, please do not hesitate to contact me.

Regards,

Kay Prcevich
PhD Student, Faculty of Education, University of Wollongong
Phone: +61 2 4221 4277
Email: khp955@uowmail.edu.au
Dear PRINCIPAL,

As a PhD student at the University of Wollongong, I am currently investigating the ways that K–2 teachers use interactive whiteboards in connection with their literacy-based pedagogical practices. I am looking to involve K–2 teachers who are interested in and confident with integrating interactive whiteboard technology and literacy. I would like to invite a K–2 teacher from your school to participate in a project entitled **Examining the ways that primary teachers use interactive whiteboards in connection with their literacy-based pedagogical practices.** I write to seek your approval and assistance to conduct this research in your school.

In the project I wish to work with K–2 teachers to explore the ways in which they are integrating interactive whiteboard technology within their daily literacy sessions. The project aims to support K–2 teachers in articulating what they do in their literacy classrooms with interactive whiteboard technology and why and how they accomplish this.

Approval is sought to visit the school on three to five occasions within term three, 2010. During these visits I would like to interview the teacher twice (30-40 mins each interview), observe the literacy session in her/his classroom on three to five occasions and hold a brief discussion (10 – 20 mins each) with the teacher following each of these observational periods. Questions will be based on individual teacher’s pedagogical approaches. Digital and audio recordings will be made of each of the literacy sessions. I would also like to copy relevant school policies, the teacher’s current program and selected work samples from the observation session.
The project is supported by the University of Wollongong Research Committee and has been reviewed by the NSW Department of Education and Training and University of Wollongong’s Human Research Ethics committees. Please find the participant information sheets for the teacher and the parents attached to this letter.

Please do not hesitate to contact me, should you wish to obtain further information about the project.

Kay Precevich  
PhD Student, Faculty of Education, University of Wollongong  
Phone: +61 2 4221 4277  
Email: khp955@uowmail.edu.au
APPENDIX F – PRINCIPAL CONSENT FORM
Faculty of Education

PRINCIPAL CONSENT FORM

Research Project: Examining the ways that primary teachers (K–2) use interactive whiteboards in connection with their literacy-based pedagogical practices

Researchers: Kay Prcevich

Principal Consent:

I have been provided with information about this project and have had opportunity to discuss the project with the researcher, Kay Prcevich. I understand the researcher is conducting this study as part of her PhD project undertaken at the University of Wollongong.

I have been advised of my involvement with the research and have had opportunity to ask Kay Prcevich any questions I may have about the research and my participation.

I understand that my participation in this research is voluntary, I am free to refuse to participate and I am free to withdraw from the research at any time. My refusal to participate or withdrawal of consent will not affect my relationship with the Faculty of Education at the University of Wollongong.

I understand that if I have any enquiries about the research I can contact Kay Prcevich (02 4221 4277) or if I have any complaints regarding the manner in which the research is/or has been conducted I can contact the Complaints Officer, Human Ethics Committee, University of Wollongong on 02 42214457.
By signing below I am indicating my consent to participate in the research project conducted by Kay Prcevich as it has been described to me. I understand that questions asked during conversations and semi-structured interviews will be based on school policies and procedures. I understand that audio records will be made as part of the study. These recordings will take place during the conversation and semi-structured interview. I understand that the data collected from my participation will be used to describe, categorise and disseminate information regarding the use of interactive whiteboard technology within NSW Department of Education and Training primary schools and literacy classrooms.

Name:

Signature:

Date:
APPENDIX G – STUDENT INFORMATION SHEET
STUDENT INFORMATION SHEET (FOR PARENTS/GUARDIANS)

**Research Project:** Examining the ways that primary teachers (K–2) use interactive whiteboards in connection with their literacy-based pedagogical practices

**Researchers:** Kay Prcevich

I am a PhD student in the Faculty of Education at the University of Wollongong.

**Why am I doing this research?**

In this research, I wish to work with teachers to explore the ways that they use and integrate interactive whiteboard technology within their daily literacy lessons. An important part of this research will be observing teachers and their students as they engage with these activities in their classrooms.

**What will it involve?**

Your child’s teacher has agreed to assist us in the study. I will observe three to five instances of the use of IWB technology in literacy sessions in her/his classroom. I anticipate each period of observation will be for approximately two hours. Digital and audio recordings will be made of the observations. The focus of these recordings will not be on individual students, but rather are intended to capture the teacher, and how they interact with the students, as well as how the teacher and students interact with the interactive whiteboard technology. These images will be used in the publication of findings to illustrate literacy experiences incorporating technology. Publication of images will be done with digital alterations so that individuals are not recognisable. I will also ask the teacher for copies of some student work samples produced during the observed literacy sessions.
Video/digital and audio recordings of you and your students will be made as part of this study. These recordings will be:

- Collected during interview and observational periods;
- Stored in a locked filing cabinet in the researcher’s (Kay Pcevich) office (23.110) at the University of Wollongong for seven years, and then they will be destroyed;
- Only the researcher (Kay Pcevich) will have access to this data and will see/hear the recordings; and,
- I will use the recordings to capture you, and how you interact with your students, as well as how you and your students interact with IWB technology.

**When will the observations be conducted?**

The interviews, classroom observations and discussions will take place during term three, 2010. These will be scheduled for times identified by the classroom teacher.

**How will students’ rights be respected?**

The research is approved by the University of Wollongong and the NSW Department of Education and Training, and will adhere to strict ethical guidelines. For example, students, teachers and schools will not be identified, participants’ interests are respected and raw data kept strictly confidential.

**What you should know:**

- Your child’s participation in the study will be treated confidentially. In both the analysis and reporting of data, your child, and their school, will not be individually identified;
- As noted on the Consent Form you are free to withhold consent or withdraw consent to participate at any time without penalty; and,
- Concerns with the conducting of the research can be addresses to the Complaints Officer, Human Research Ethics Committee, University of Wollongong on 02 42214457.

Thank you for your support in assisting with this study. Please do not hesitate to contact me if, at any time, you have questions about the research.

Kay Pcevich
PhD Student, Faculty of Education, University of Wollongong
Phone: +61 2 4221 4277
Email:khp955@uowmail.edu.au
APPENDIX H – STUDENT CONSENT FORM
STUDENT CONSENT FORM (TO BE COMPLETED BY PARENTS/GUARDIANS)

Research Project: Examining the ways that primary teachers (K–2) use interactive whiteboards in connection with their literacy-based pedagogical practices

Researchers: Kay Prcievich

Parent/Guardian Consent:

I have been provided with information about this project and have had opportunity to discuss the project with my child’s teacher and the researcher (Kay Prcievich). I understand my child’s teacher has agreed to take part in the research that this researcher is conducting as part of her PhD project undertaken at the University of Wollongong.

I have been advised of my child’s involvement with the research and have had opportunity to ask my child’s teacher and Kay Prcievich any questions I may have about the research and my child’s participation. I understand the focus of the research is not on my child, but rather the use of interactive whiteboard technology within the literacy teaching and learning activities that are available within my child’s classroom.

I understand that digital images will be captured as my child works within their classroom. The purpose of the collection of the images is to identify and describe teaching and learning activities, not the performance of individual children. I understand these images may be used within the reporting of collected data and
research findings. Your child will not be identifiable from these images. I understand that names of individual children and schools will not accompany any image used. I understand that my child’s work samples (produced during the observed literacy sessions) may be collected. I understand these work samples may be used within the reporting of collected data and research findings. Your child will not be identifiable from these work samples.

I understand that my child’s participation in this research is voluntary, I am free to refuse for my child to be filmed and I am free to withdraw their inclusion from the research at any time. My refusal to participate or withdrawal of consent will not affect my relationship with the school nor the Faculty of Education at the University of Wollongong.

I understand that if I have any enquiries about the research I can contact Kay Prcevich (02 4221 4277) or if I have any complaints regarding the manner in which the research is/or has been conducted I can contact the Complaints Officer, Human Ethics Committee, University of Wollongong on 02 42214457.

By signing below I am indicating my consent for my child to participate in the research project conducted by Kay Prcevich as it has been described to me. I understand that the data collected from my child’s classroom will be used to describe, categorise and disseminate information regarding the use of interactive whiteboard technology within literacy classrooms.

Child’s Name:

Parent’s Name:

Signature:

Date:
APPENDIX I – PRINCIPAL INTERVIEW PROTOCOL
Principal Interview Protocol

1. The School
1.1 School Name:
1.2 Location of the School:
1.3 Age of the School:

2. The Teachers
2.1 Number of Teachers:
2.2 Cultural Background of Teachers:
2.3 Average Age of Teachers:

3. The Students
3.1 Number of Students at the School:
3.2 Number of Students in Each Grade:
3.3 Number of Classes for Each Grade:
3.4 Cultural Background of Students:

4. IWB’s and the School
4.1 Number of IWB’s in the School?

4.2 How are they spread across the school? i.e., only in particular classes (e.g., infants) or are they spread across all grades? One in every classroom etc.

4.3 School policies in relation to IWB technology: Y / N

4.4 What has the school put in place to support IWB technology use?
APPENDIX J – TEACHER INTERVIEW PROTOCOL
Teacher Interview Protocol

1. General
1.1 Teacher’s Name:
1.2 School’s Name:
1.3 Class/Grade Currently Teaching:

2. Teaching Experience – A Brief History
2.1 How long have you been teaching for?
2.2 Same school? Different school?
2.3 How long have you been at this school for?
2.4 How long have you been teaching this grade for?
2.5 Have you taught all grades from K–6 during your teaching career?

3. A brief history on the use of IWB technology within your classroom
3.1 Level of expertise with technology - In general, how would you rate your level of technology competence?
   1 = Poor
   2 = Fair
   3 = Good
   4 = Very Good
   5 = Excellent

3.2 Level of expertise with IWB technology - How would you rate your level of IWB competence?
   1 = Poor
   2 = Fair
   3 = Good
   4 = Very Good
   5 = Excellent

3.3 When did you get an IWB in your classroom?

3.4 How long have you had an IWB in your classroom?
3.5 When did you start to use an IWB?

3.6 How did you learn how to use one?

3.7 What did you first do on it?

3.8 On an average school day, how often do you use your IWB?

3.9 Can you explain an average school day in terms of your use of your IWB?

3.10 Do you use it every day for one particular task/activity/KLA? i.e., just math groups.

3.11 What type of IWB resources do you use?

3.12 How long would it take you to construct a ½ hour experience using the IWB?

3.13 What is the main purpose you feel an IWB is good for?

3.14 What are your perceptions on IWB use in Primary School classrooms? How do you believe they are being used? i.e., well, poorly etc.

3.15 Why? What makes you say this?

3.16 Do you have a personal interest in literacy?

3.17 Tell me about the way you use IWB technology in your literacy lessons.

3.18 Why?

3.19 How do your students respond?

3.20 How confident do you feel using an IWB?
3.21 How did you learn how to use an IWB?
3.22 How did the students acquire their knowledge and skills?

3.23 Do you think the use of IWB technology enhances students’ literacy learning?
3.24 Why?
3.25 How?

4. Access to Professional Development
4.1 What sort of support do you have in relation to IWB use? Both technical support and general use support.

4.2 What professional development have you had access to in relation to IWB’s?

4.3 How often do you attend professional development courses in relation to IWB’s?

4.4 Do you maintain your professional development in relation to IWB’s?

4.5 If so, how?

4.6 Inside or outside school time?

4.7 What does the school offer in relation to IWB professional development?
APPENDIX K – TEACHER INTERVIEW AND OBSERVATION TIMES
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APPENDIX L – AUDIT TRAIL
## Gabby

<table>
<thead>
<tr>
<th>Date</th>
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| 27 August, 2010    | Initial semi-structured interview (pre-observations) with Gabby (G-II-27.8.10)  
Semi-structured interview with the deputy principal (G-DPI-27.8.10)  
Collection of school and teacher artefacts (G-STA-27.8.10) |
| 30 August, 2010    | First observation of Gabby  
Field notes (G-FN1-30.8.10)  
Video Recording (G-VR1-30.8.10)  
Audio Recording (G-AR1-30.8.10)  
Collection of lesson materials (G-LM1-30.8.10)  
Semi-structured discussion (post first observation) with Gabby (G-D1-30.8.10) |
| 31 August, 2010    | Second observation of Gabby  
Field notes (G-FN2-31.8.10)  
Video Recording (G-VR2-31.8.10)  
Audio Recording (G-AR2-31.8.10)  
Collection of lesson materials (G-LM2-31.8.10)  
Semi-structured discussion (post second observation) with Gabby (G-D2-31.8.10) |
| 01 September, 2010 | Third observation of Gabby  
Field notes (G-FN3-1.9.10)  
Video Recording (G-VR3-1.9.10)  
Audio Recording (G-AR3-1.9.10)  
Collection of lesson materials (G-LM3-1.9.10)  
Semi-structured discussion (post third observation) with Gabby (G-D3-1.9.10) |
| 02 September, 2010 | Fourth observation of Gabby  
Field notes (G-FN4-2.9.10)  
Video Recording (G-VR4-2.9.10)  
Audio Recording (G-AR4-2.9.10)  
Collection of lesson materials (G-LM4-2.9.10)  
Semi-structured discussion (post fourth observation) with Gabby (G-D4-2.9.10) |
<p>| 28 October, 2010   | Final semi-structured interview (post observations) with Gabby (G-FI-28.10.10) |</p>
<table>
<thead>
<tr>
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<td>23 July, 2010</td>
<td>Initial semi-structured interview (pre-observations) with Kaitlyn <em>(K-II-23.7.10)</em></td>
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<td>Semi-structured interview with the principal <em>(K-PI-23.7.10)</em></td>
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<td>Collection of school and teacher artefacts <em>(K-STA-23.7.10)</em></td>
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<td>Field notes <em>(K-FN1-26.7.10)</em></td>
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<td>Video Recording <em>(K-VR1-26.7.10)</em></td>
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<td>Audio Recording <em>(K-AR1-26.7.10)</em></td>
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<td>Collection of lesson materials <em>(K-LM1-26.7.10)</em></td>
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<tr>
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<td>Semi-structured discussion (post first observation) with Kaitlyn <em>(K-D1-26.7.10)</em></td>
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<td>27 July, 2010</td>
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<td>Video Recording <em>(K-VR2-27.7.10)</em></td>
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<td>Audio Recording <em>(K-AR2-27.7.10)</em></td>
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<td>Collection of lesson materials <em>(K-LM3-28.7.10)</em></td>
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<td>Semi-structured discussion (post third observation) with Kaitlyn <em>(K-D3-28.7.10)</em></td>
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<td>Collection of lesson materials <em>(K-LM4-29.7.10)</em></td>
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<td>Semi-structured discussion (post fourth observation) with Kaitlyn <em>(K-D4-29.7.10)</em></td>
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<td>20 September 2010</td>
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<td>06 August, 2010</td>
<td>Initial semi-structured interview (pre-observations) with Declan (D-II-6.8.10) Semi-structured interview with the principal (D-PI-6.8.10) Collection of school and teacher artefacts (D-STA-6.8.10)</td>
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<td>10 August, 2010</td>
<td>Second observation of Declan Field notes (D-FN2-10.8.10) Video Recording (D-VR2-10.8.10) Audio Recording (D-AR2-10.8.10) Collection of lesson materials (D-LM2-10.8.10) Semi-structured discussion (post second observation) with Declan (D-D2-10.8.10)</td>
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APPENDIX M – TEMPLATE FOR FIELD NOTES
# FIELD NOTES

Name of Participant: ____________

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<th>Date:</th>
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APPENDIX N – Gabby’s Classroom Setting/Layout
Front scene of Gabby’s classroom setting/layout

Back scene of Gabby’s classroom setting/layout
APPENDIX O – KAITLYN’S CLASSROOM SETTING/LAYOUT
Front scene of Kaitlyn’s classroom setting/layout

Centre scene of Kaitlyn’s classroom setting/layout
APPENDIX P – DECLAN’S CLASSROOM SETTING/LAYOUT
Front left scene of Declan’s classroom setting/layout

Front right scene of Declan’s classroom setting/layout