The Interactive Whiteboard in an Irish Primary School, a catalyst for pedagogic change?

A Case Study

Master of Arts

(Digital Media Development for Education)

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Declaration:

I hereby declare that this project is entirely my own work, and that it has not been submitted for any other academic award, or part thereof, at this or any other educational establishment.

Signed: _____

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Abstract

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Education like most other areas has been influenced by the rapidly changing environment in which we live in today. The revised primary school curriculum has encouraged teachers to examine different approaches such as ICT in order to enhance teaching in the classroom. The introduction of the Interactive Whiteboard (IWB) has attempted to develop these newer pedagogical approaches within the classroom.

From reviewing the current literature, there has been an indication that the role of the IWB in the classroom has the potential to transform both teaching and learning. However, there is the belief that there are a number of challenges which may influence its benefits within the classroom context.

The research was primarily of a qualitative and quantitative nature. The study used to a great extent interviews, observation and documentary evidence.

The research findings indicated that the interactive whiteboard was being integrated within the existing pedagogies of the teachers in the case study. It was also found that the teachers exhibited a teaching style that was initially didactic but progressed towards the development of an interactive approach within the lessons observed. An important note in the findings was that although the IWBs had not altogether transformed the pedagogies of the teachers, it was observed that a number of challenges may have prevented the pedagogies from being developed extensively.

The findings of the case study suggested that there is a need for a more holistic approach to pedagogic training. As technology is constantly re-shaping itself at a fast rate, there is a need for educators to examine the role of policies in developing professional development opportunities. This development must in turn allow teachers time and opportunity to experiment with the IWBs, in order for a more transformative pedagogic change to occur within the classroom.

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List of Abbreviations

BOM	Board of Management
GPA	Grade Point Averages
ICT	Information and Communications Technology
IEPs	Individual Education Plans
INTO	Irish National Teacher's Organisation
IT	Information Technology
IWB	Interactive Whiteboard
MCAT	Medical College Admission Test
NCCA	National Council for Curriculum and Assessment
N.S.	National School
OECD	Organisation for Economic Co-operation and Organisation
OFSTED	Office for Standards in Education
SCOTS	System for Classroom Observation of Teaching Strategies
WWW	World Wide Web

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Chapter 1 – Introduction

1.1 Introduction

The technology known as Interactive Whiteboards (IWBs) has become a widely recognised symbol of the changes that are taking place within in the classroom in the last decade. Its introduction within this setting has been seen as a major effort to significantly improve and extend teaching practices throughout the primary education system, (Kennewell and Beauchamp, 2007). It has been suggested in previous research that IWBs may be used more extensively at primary level because 'they are viewed as a resource which is more suitable to primary strategies and whole-class teaching', (Rudd, 2007, p.5).

According to the OECD report 'Learning to Change' ICT in Schools (2001), it recommends a rationale for the inclusion of ICT in education. Its pedagogical rationale 'looks to the use of ICT in teaching based upon its potential to increase the richness of the child's learning', (NCCA, 2004, p.7).

Much of the literature in the area of IWBs suggests that the technology can transform classroom practices. It can be seen to offer a versatile and dynamic teaching and learning tool, when used as a presentational device. Its use of multimodal features can also allow teachers to present the information which takes into account the different learning styles, (Smyth et al., 2005).

However, there is a consensus that the introduction of IWBs has encouraged and reinforced a didactic approach and increased teacher control within the classrooms. There have also been other indications from research which have suggested that a number of barriers have prevented its integration into pedagogic practices, (Rudd, 2007).

This introduces the question as to whether and to what an extent IWBs may be allowing teachers to change their pedagogy?

However, Higgins et al., (2007) have noted that the skills and professional knowledge of the teacher mediating interactions with the pupils is the crucial factor in determining how much 'value' is gained from IWBs.

1.2 Central Thesis Question

The aim of the thesis was to investigate the role of the Interactive Whiteboard (IWB) as a catalyst for pedagogic change within an Irish Primary Classroom. It was intended to examine the pedagogical approaches that were in existence prior to the IWB introduction. Subsequently, it was hoped to ascertain whether the introduction of the IWB had led to changes in the teacher's pedagogy and if so, identify the reasons for these changes.

1.3 Relevance

The developments in ICT in Irish Education within the last two decades, has been as a consequence of the introduction of national policies regarding ICT. This has resulted in large scale investment in the availability of ICT in the classroom and also professional development, (NCCA, 2004).

It can be observed from existing research and is the case with a lot of ICT initiatives, that technology has been introduced into the classrooms because it is readily available. According to NCCA (2004), a significant number of schools have some ICT equipment, but the extent of its use has been infrequent. In many instances, it was not introduced due to education led reasons, in other words to meet the educational needs of the children or the professional needs of the teachers. This has created the opinion that there is insufficient use of the technology within these classrooms, (Gillen et al., 2007).

These views have been supported by Dawes (2000).

> Research conducted on the introduction of ICT equipment to schools has indicated that a technology led mode of introduction can create problems, regarding the teacher's take-up of the technology as a pedagogic tool, (Dawes, 2000, p.237).

1.4 Research Methodology

- The principal research approach was to focus on the teacher's pedagogy, in the context of whether or not it had been influenced by the introduction of the IWB into the classroom.
- The data from the study was obtained from several sources of both a qualitative and quantitative nature. Initially, each teacher was interviewed to examine the ways they had taught previously and the ways in which the IWBs may have influenced their pedagogy.
- Additional questioning hoped to identify how their teaching may have changed within the classroom context and the way in which their planning and preparation may have been affected.
- An Observation Schedule was used to examine the teacher's pedagogy in relation to their IWB use within the classroom.
- Documentary Analysis was included which examined school documents in order to triangulate the data from other sources.
- The findings in the research were used in conjunction with the findings from the literature review to ascertain the extent in which IWBs may have influenced their pedagogy.

1.4.1 Limitations

As the research involved an analysis of pedagogy, a certain degree of concern was expressed when interviewing both teachers within the study. Teaching is considered to be a professional discipline and an interview could often be seen to be an intrusion into their professional lives. Consequently, it could be felt that the individuals may not have been as forthcoming with information.

The author had concern regarding how individuals may have reacted while being observed within the classroom environment. With this in mind, it was felt that the presence of the author within the observation environment may have altered the situation.

The observation schedule used was narrowed down from its original number, due to the small nature of the study. Also, a certain degree of bias by the author could have been generated through the movement from low to a higher degree of inference.

In order to triangulate the data, it was proposed that the use of monthly schemes, planning, minutes from meeting and IEPs would be used. In terms of documentary evidence, the availability of documents in research can often be an area of concern. Sometimes documents may not accurately reflect what may have occurred in a particular situation.

1.5 Outline of Thesis

In this research, Chapter two reviews the literature among accredited researchers in the field of IWBs. It will focus the literature around the themes of Interactive Whiteboards, the Irish Primary School Curriculum and ICT, Pedagogy in the Primary Classroom and Professional Development and Change.

Chapter three describes the methodology used in the research. Firstly, it introduces the setting and the participants and rationale for use. Secondly, it will discuss the research instruments of interview, observation and documentary evidence.

Chapter four examines the research findings from the interviews conducted with both teachers, the classroom observation of the teachers and analysis of the school documentary evidence.

Chapter five discusses the findings from chapter four and compares the findings with the views of accredited researchers from the literature review.

Chapter six concludes the research and comments on how pedagogic change and Interactive Whiteboard (IWB) use may take place within an Irish primary classroom.

Chapter 2 – Literature Review

2.1 Interactive Whiteboards

2.1.1 A brief history

In the last few years, the concept of Interactive Whiteboards (IWBs) and the claims of transformations in teacher's practices have been made by policy makers and also by the manufacturers of the technology (Gillen et al., 2007).

Interactive Whiteboards were invented by SMART Technologies[1] in 1991. Originally they were designed for the creation of presentations within office settings, (Murphy et al., 1995). However, within the educational context, they have been used in higher education. Although, their potential for use in primary schools was acknowledged in the late 1990's (Moseley et al., 1999), the general belief is that IWBs will have so called 'blanket benefits for learning', (Gillen et al., 2007, p.3).

The culture of IWB technology has only been introduced to schools in Ireland in the last few years. The introduction and establishment of IWBs within schools largely depended on views of staff members, (Miller & Glover, 2001). The use of technology as a pedagogic tool can create difficulties where a technology led as apposed to an education led mode of introduction is introduced, (Dawes, 2000).

Although in contrast to this, the proposed benefits are that 'every school of the future will have an interactive whiteboard in the classroom and that technology has already revolutionised learning', (Arnott, 2004 cited in Gillen et al., 2007, p. 244)

2.1.2 What is an Interactive Whiteboard?

An interactive whiteboard is a 'large, touch sensitive board which is connected to a digital projector and a computer' (Becta, 2003, p.1). It has the same functionality as

[1] SMART Technologies is both the industry pioneer and market-segment leader in easy-to-use interactive whiteboards and other group collaboration tools.

a computer, which allows it to connect to the internet, show digital images, produce sound and is able to run interactive software.

Depending on the type of IWB, writing can be conducted on the board using a special pen or with the finger. However, its principal advantage is that the large screen is visible to a whole class, whereas an ordinary monitor can only be used by a small group, (Becta, 2007).

As with most technologies, the introduction of technology will cause teachers to be faced with a 'cost benefit conundrum', (Rudd, 2007, p.7). From reviewing the literature, there is very little information concerning the cost benefit analysis of an IWB. However, the most expensive costs nearly € 6000, whereas others can cost less than € 2000. This raises the question as to 'whether the sub €2000 IWB any worse than the €6000 one'?, (Anseo, 2009, [Online]). The Anseo website further suggests that

> along with the computer, projector and the touch sensitive board, a fourth element is the teacher which gels it altogether. He/She is the person who must collect/collate the resources to make sure the lesson goes well. Whether or not the IWB has all the clipart in the world does not make the lesson any better. If you break an IWB down into its three basic parts excluding the teacher, they all do exactly the same thing, (Anseo, 2009, [Online]).

2.1.3 The Benefits of Interactive Whiteboard Use

From reviewing the literature, a number of benefits of IWBs have been identified. They have been recognised as capable of generating effective demonstrations and being suitable to whole class teaching, (Stephens, 2000). According to Smith et al., (2005), in contrast to other resources they can more suitably capture the attention of children. The resources created by IWBs are also considered to be appealing to both teachers and children (Ball, 2003; Kennewell, 2004). It has also been reported by teachers that IWBs across age groups are a versatile and flexible teaching tool. This has ranged from nursery to higher education, (Smith et al., 2005).

Anseo (2009) conducted some research in the area of IWBs and their use in the classroom found that they can be considered to enhance motivation in learning.

Their explanation is that

> the simple reason is that the IWB is a novelty. Clutching a "magic" pen and moving stuff around a giant screen is a novelty and this motivates, (Anseo, 2009, [Online]).

2.1.4 Potential of an IWB to transform learning

A considerable amount of research has been conducted by Somekh (2000), in relation to the role in which ICT has the potential to transform learning. Much of her findings in the literature have supported a constructivist approach to learning. Her view is that

> the presence of an IWB in the classroom has the potential to change the culture and relationship between teachers and children. She notes the use of a teacher and children working around a large screen enabling collaborative tasks and the opportunity for the teacher to provide scaffolding, (Somekh, 2000, p.22)

Cogill (2002) states that it is important that teachers conceive the role of technology as a cognitive tool that can be used by students in many ways. This is supported previously in the literature by Gokhale (1995) and Smyth (1999).

Unfortunately, others are not in agreement with this scenario. According to Hinostoza and Mellar (2000), teachers may be misunderstanding their role in using ICT. They report that

> this gives us some insight into what these teachers saw as progressive teaching methods, they considered their role while using constructivist methods was to manage the classroom and did not see their actions as involving scaffolding, counselling or tutoring pupils. (Hinostoza and Mellar, 2000, p. 405)

Cogill (2002) comments that 'it is the endorsement of ICT for children's independent learning that is confusing teachers and a lack of clarity as to what their role should be in the computer suite', (Cogill, 2002, p. 10).

Therefore, it seems that the use of an IWB may give teachers greater control of the learning process. Although, both Wood (2001) and Smith (2001) have suggested there is a danger that the children's own learning may be impacted as a result of the teacher dominating the lesson.

2.1.5 The Concerns of Interactive Whiteboard Use

Cogill (2003) and Knight et al. (2004) in a study observed that IWBs are not necessarily used interactively. They also found that pupils reported that the presentation of information could often be confusing. It was further argued that without positive support, IWBs could reinforce a teacher-centred style of delivery.

However, it is interesting to observe the findings from an evaluative study of IWB use conducted by Beeland (2002). He found that lessons where teachers made least use of the interactive potential of the technology, and most use of their facility to present multimedia resources, received more positive comments from pupils.

However, Anseo (2009) believes that a concern in the effective use of IWBs involves time management. It states

> the child must stand up, trip over his/her bag, squeeze through their overcrowded classroom to the whiteboard. Get the pen from the teacher, drop it and get given out to by the teacher for dropping it. Pick it up, click on the right answer. Squeeze back through the tables and chairs. Trip over his/her friend's bag. Spill a box of crayons while gaining composure. Pick up the crayons and finally sit down in his/her seat. The child could simply have answered the problem orally from his/her seat, (Anseo, 2009, [Online]).

There are some concerns however, that as pupils become familiar with the features of IWBs the 'novelty value' may subsequently disappear, (Levy, 2002). This is further supported by Anseo (2009), where they report that

> a child may not like the rest of the class watching him/her struggle over a multiple choice question, and be petrified of getting an incorrect answer. In this instance, the novelty factor may have worn off and the IWB is now seen as another way of learning,
> (Anseo, 2009, [Online]).

2.2 The Irish Primary School Curriculum & ICT

2.2.1 The Ethos of the Curriculum

The revised Primary School Curriculum was launched in 1999. Its principal aim is to 'nurture the child in all dimensions of his or her life – spiritual, moral, cognitive,

emotional, imaginative, aesthetic, social and physical', (DES, 1999, p.6). The vision of the curriculum towards education is expressed in the form of three general aims:

1. to enable the child to live as a child and to realise his or her potential as a unique individual,
2. to enable the child to develop as a social being through living and co-operating with others and so contribute to the good of society,
3. to prepare the child for further education and lifelong learning.

(DES, 1999, p.34).

2.2.2 Teaching and Learning in the Irish Primary Curriculum

The revised curriculum states that in order to complement learning, approaches to teaching can and must be varied and take into consideration 'the differences in children, their interests and motivation, their varied personalities and the many ways in which they learn', (DES, 1999, p.20). It is also stated in the curriculum that there is a need for teachers to be aware of changes and developments in educational theory.

The success of the child's development and learning in school is determined by the quality of teaching. It is the teacher who 'plans and directs the learning process by exercising their professional discretion in planning for the child's needs', (DES, 1999, p.20).

The learning process for the child takes place in a variety of different ways. Therefore, in order to ensure a rich and varied learning process, the teacher needs to ensure that children's learning is varied. The Irish primary curriculum therefore places equal importance to what a child learns and the process by which he or she learns it. As a consequence, different forms of classroom organisation complements the variety of learning the curriculum has to offer, (DES, 1999).

In order to achieve different learning goals, the 'ability to work individually and collaboratively in groups, whole class teaching and learning is appropriate in particular learning contexts', (DES, 1999, p.21). Consequently, the potential of Information and Communication Technologies (ICT) in realising these goals becomes even more evident.

2.2.3 Government ICT Policy and it's Aims

The Irish government has also recognised the enormous significance of knowledge society developments on the educational sector, and within society in general. In the last decade, two Irish government policies for ICT in Irish Education have been published and implemented, (NCCA, 2004). They are:

- Schools IT2000, A Policy Framework for the New Millennium (1997)
- A Blueprint for the Future of ICT in Irish Education (2001)

The most recent Blueprint policy outlined the main thrust of the government's three year strategy, which was to:

- Expand ICT capital provision to schools
- Increase access to, and use of, internet technologies
- Further integrate ICT in teaching and learning
- Enhance professional development opportunities for teachers

(NCCA, 2004, p.12)

In 2004, the National Council for Curriculum and Assessment (NCCA) completed a discussion paper. This proposed a series of guidelines concerning the role of Information and Communications Technology (ICT) in curriculum and assessment in Irish Primary Schools. This document was developed to examine and assist discussions and deliberations regarding the potential of ICT to support and extend the work of the NCCA regarding curriculum development (NCCA, 2004).

In February 2007, the Government announced that over a five year period a further € 252 million would be invested (National Development Plan, 2007). Although, Trench (2008) comments that

> the Government's action plan does not specify what kinds of technology within schools to invest in, therefore individual schools allocate their own investment however they see it, (Trench, 2008, p.4).

2.2.4 The Role of ICT in the Curriculum

Within the past decade, Irish society has undergone rapid levels of growth and change. In order for society to sustain these levels, children must be equipped with the skills for the knowledge society in which they will live. The use of ICT provides teachers with opportunities to develop new teaching methods and allows children to acquire these new skills, (DES, 2008).

The curriculum states:

> Technological skills are increasingly important for advancement in education, work, and leisure. The curriculum integrates ICT into the teaching and learning process and provides children with opportunities to use modern technology to enhance their learning in all subjects, (DES, 1999, p.29).

In the literature, it has been noted by the Investigating Effectively in ICT report that the principal challenge to the integration of ICT within the curriculum is:

> that the emphasis needs to shift from technology provision to a focus on its deliberate use by the learner. Fostering personal creativity has always been a desirable educational value. The pursuit of creativity and inventiveness are now pivotal skills in a knowledge economy and the embedding of ICT in learning can greatly facilitate their development.
>
> (DES, 2008, p.2).

This is supported by the INTO website where they state that,

> ICT has the potential to transform teaching and learning when integrated appropriately. It can substantially change the traditional classroom where the teacher has control of pupil's learning to one where students learn collaboratively and where in the main pupils construct or discover knowledge themselves, (INTO, 2009, [Online]).

The integration of ICT facilitates this through a process that was not possible in the past. In contrast to traditional teaching pedagogies, it was found that it allows greater opportunities to engage children with active and collaborative learning.

Consequently, this may enact a change in their teaching as an outcome of this realisation, (NCCA, 2004).

The integration of ICT in teaching and learning allows many teachers to examine their own attitudes and beliefs in relation to pedagogy according to Lai (1999). It offers a fundamental change agenda where teachers can use new technology along with modern teaching pedagogies and developments in learning theory, (NCCA, 2004).

A number of primary schools have undertaken numerous steps towards incorporating ICT into their curriculum. In particular, St. Joseph's Boy's N.S. in Terenure has established a digital curriculum. The schools ICT co-ordinator points out that

> the development of a digital curriculum is not just a case of installing hardware in schools. It needs a more integrated approach. Teachers will enhance ICT if it is a better way to deliver the curriculum. This is the way forward, (Anseo, 2009, [Online])

2.2.5 ICT and the Development of Children's Critical Thinking

Collaborative or group work exposes children to the individual perceptions that others may have of a problem or a situation, (DES, 1999). Gokhale (1995) described collaborative learning as 'an instruction method in which students work together towards a common goal', (Gokhale, 1995, p.114). Smyth (1999) proposes the view that ICT is an important tool in facilitating group work and collaboration and that this type of learning can promote critical thinking.

This belief in the promotion of critical thinking is furthered supported by Gokhale in his research. His study examined whether drill and practice and critical thinking skills were enhanced by either individual or collaborative learning. It could be seen from the literature that the children who participated in collaborative learning performed better on a critical thinking test than the children who worked individually, (Smyth, 1999).

However, Carlson and White (1998) are not altogether in agreement with these findings. Although, they acknowledge that teachers use a variety of tools and techniques to teach children. They feel that there needs to be a continuous adjustment to these tools and techniques.

2.2.6 Obstacles in Implementing Change

Within the last decade, the State's intervention for ICT in Primary Schools 'is struggling in practical terms to implement the philosophies and theories about how ICT can be effectively used in schools', (Trench, 2008, [Online]).

Sheppard (2003) has commented that in the last 50 years, there has been little change in schools. In order to bring about organisational learning change, he examines the styles of leadership that are in existence. As many other changes are occurring in the educational world, he comments that changes in technology are occurring at the same time. Consequently, this will influence the effect technology has on education.

Within the education system, Principal teachers are considered to be leaders of curriculum innovation. They need specific professional development opportunities in relation to leadership and ICT, when dealing with implementing innovation and change, (Sheppard, 2003). He further commented that quite often the leaders who initiated change were not confident in the new technologies, but empowered others to learn. In many instances, the young teachers tended to know more about the new technology and were more confident than the experienced teachers. It was felt that this consequently generated a threat to the power balance within the school system, (Sheppard, 2003).

However, in contrast to this, Trench (2008) states that primary teachers who are reluctant to embrace change in the educational curriculum have the power to totally resist ICT. With this in mind, improvements in professional development 'needs to be influenced and supported by the Board of Management at school level', (INTO, 2009, [Online]).

Within the teaching system there are 'varying levels of teacher confidence and ability to use ICT effectively in schools', (INTO, 2009, [Online]). The OFSTED Report (2004) commented that teacher's lack of confidence may result in poor use of technology. It also expressed concern over ICT skill levels and training for teachers. As mentioned earlier in the literature, despite an announcement of funding in 2007 of €250 million under the National Development Plan, 'only €2.2 million has been secured for the placing of ICT proficiency at the heart of the learning process', (DICTAT, 2009, [Online]).

The introduction of any new technology into a classroom requires teachers to be trained technically and to change their existing pedagogy, (Harris, 2002). However, in other instances schools such as Inver N.S. in Co. Mayo, has received no funding under the ICT schools initiatives, but has made innovative steps in changing their pedagogy to incorporate ICT, (Inver, 2009).

2.3 Pedagogy in the Primary Classroom

2.3.1 Pedagogy: A Definition

Pedagogy is often referred to as 'the practice (or the art, the science, or the craft) of teaching', (Blatchford et al.,(2002), [Online]). In contrast to this, Smyth (1987) feels that the concept of pedagogy has come to be misconstrued as the science or instruction of teaching.

However, a more detailed definition of pedagogy is expressed by Gage (1985). He states that pedagogy is based around a series of strategies and instructional techniques which allow learning to take place. It allows opportunities for

> the acquisition of skills and knowledge within a particular social and material context. It refers to the interactive process between teacher and learner and to the learning environment, (Gage, 1985 cited in Blatchford et el., 2002, [Online]).

2.3.2 Teachers' Attitudes towards ICT in the Classroom

Teachers are considered to play critical roles in ensuring effective use of IWBs as pedagogical tools at all stages in education. This ranges from the introduction of IWBs into the classroom to their successful and effective usage by students and teachers. A number of research studies have focused on IWB use with changes to student practices and to student learning and the willingness of teachers to harness the full potential of the IWB to gain desired outcomes, (Schuck & Kearney, 2007).

Cogill (2002), suggests that prior experience in using a computer and manipulating software applications is an important skill in order to use an IWB beyond just use as a chalkboard. She further believes that how the IWB is adopted for teaching may be influenced by factors which affect the teachers' confidence, competence, beliefs and attitudes in using ICT.

A central factor to good practice in teaching and learning with ICT is the role of the teacher. The ability to experiment with the software being used and adopt IT to support their existing pedagogy is considered a major factor in the success of teachers. This practice is often innovative and teachers consider collaborative work and discussion an important aspect of teaching, (Watson, 1983).

Cogill (2002) comments,

> furthermore, the use of the technology by pupils reflected the teachers own enthusiasm and confidence. The implementation of ICT activities was primarily dependent on individual teacher initiatives. The enthusiastic ICT teacher demonstrated patience, a willingness to experiment and flexibility in their approach, (Cogill, 2002, p.8)

In contrast to this, Hughes and Longman (2005) noted IWBs were being used mainly in a presentation mode and did not observe any teachers attempting to allow learners to 'create their own models, frameworks, language and way of working'. They indicated that teacher's beliefs about teaching were influential in their ability to fully orchestrate the affordances of the IWB.

One of the problems associated with the use of ICT in the classroom has been the boundaries between the teacher and student interactions. Andrews (1999) states that

> many teachers appear ambivalent towards computers: unable to reconcile professional beliefs concerning the value of teacher-student interactions, with the perception of the computer as teacher, (Andrews, 1999, p.124)

However, Crawford (1999) adds that there is a movement in the traditional relationship between teachers and pupils, from teachers as 'gods of knowledge' to directors of learning. It can be seen in the literature that Eraut (1991), Handy and Aitken (1986) and Somekh and Davies (1991) concur these views. The use of the ICT within the classroom can give rise to difficulties which are dependent on

> teachers' individual constructs, and can include: loss of control, change in teacher-student relationships, change in working habits, loss of autonomy and threats to knowledge base, (Cogill, 2002, p.9).

OFSTED (2002) further supports this view within the primary school context. They reported that the IWB potentially allows the use of ICT for front of class teaching which in turn may alleviate the teacher's feelings of loss of control.

> Many teachers find it easier to use ICT during a literacy hour or mathematics lesson when a projector and screen are available for whole class instruction.
>
> Essentially, the whole class activities – shared reading and writing, word level work, or oral and mental mathematics – are followed by pupils using computers in pairs or individually, (OFSTED, 2002, p. 9)

However, Veen (1995) points out that teacher's beliefs change very slowly. It is felt that teachers adopt new media if they can use them within their existing practices and beliefs. He believes that initial ICT course materials can assist with teacher's existing classroom practice. This will enable them to adapt their existing way of teaching and move towards professional change. Furthermore, the teachers who are unwilling to adopt new practices may be encouraged to change through the introduction of an IWB.

2.3.3 Pedagogical Approaches and IWBs

Moss et al., (2007) in the literature, identify three themes that dominate thinking about the potential role of IWBs in changing pedagogy. These are pace, multimodality, and interactivity.

- Multimodality: The ability of the IWB to include a wider range of multimodal resources, in order to assist pupil learning, (Ball, 2003; Kennewell, 2004, Levy, 2002)

- Pace: Its capacity to increase the pace, efficiency of classroom delivery and the best use of teacher time (Ball, 2003; Miller, 2003; Becta, 2004; Smith et al, 2005)

- Interaction: Its ability to enhance interactive whole class teaching (Glover & Miller, 2001; Ball, 2003; Becta, 2004)

This has been supported and furthered in research by Jewitt (2007). In his research, it showed that in many ways these three concepts underpin teachers' design of lessons for the IWB. However, it is less clear to the extent in which these aspects of IWB use really transform pedagogy.

In the literature some of the classroom based research on IWBs has questioned whether IWBs support interactivity. These are divided into surface, superficial or deep interactivity (Hargreaves et al., 2003). Cogill (2002) observes that IWBs are not necessarily used interactively. This is supported by Knight et al., (2004) where it is argued that IWBs can reinforce a teacher-centred style of delivery, without positive intervention.

The pedagogical approach taken with respect to IWBs will largely depend on the attitude of teachers and how they are willing to embed this technology in the classroom. Miller et al., (2005) found planning and preparation by teachers to be the central feature in pedagogy. They reported that teachers tended to plan for cognitive development while taking into account the needs of individual pupils. In order to encourage a thinking approach, they used a three-part lesson structure that provided activities.

In order for changes to evolve, teacher effectiveness is critical in initiating changes. This has been aptly pointed out by Miller et al., (2005) in a literature survey of use of IWBs. They commented that 'as teachers become more fluent in their use of

technology and recognise the link to pedagogic change, the IWB becomes the focus of changed approaches' (Miller et al, 2005, p.19).

The literature shows clearly that some marked changes in pedagogy have occurred following the introduction of the IWB. The use of an IWB in the classroom would increase interactivity and active learning. Morrison (2003) in his research has argued that the introduction of an IWB into the classroom created a learning community. Interactivity can be divided into two key areas which are namely 'teaching and learning', (Brown, 2004, [Online]).

With this in mind, Ferl (2005) comments that interactive teaching can be defined as when the

> teacher modifies his or her approach, in response to the needs of the learners' and interactive learning takes place when the learner interacts with the 'teacher, with peers, with resources or with all three, (Ferl, 2005, [Online]).

In contrast to this, McCormick and Scrimshaw (2001), have commented although new technology has allowed teachers to teach more efficiently, their pedagogy had barely changed. In support of this, Kennewell (2004) considered that during the last two decades, the introduction of ICT resources to schools has had little effect on the ways that teachers teach. This is in comparison to the initiatives for strategies in numeracy and literacy. Although, Somekh et al., (2005) highlighted in the literature that the ambiance of classrooms had changed significantly as a result of IWBs, they also noted that quite often teaching remained 'didactic' as opposed to encouraging learner autonomy. Consequently, IWBs tended to complement existing whole-class teaching approaches.

The belief that teachers had not changed their pedagogy with IWBs is supported by research conducted by both Greiffenhagen (2002) and Levy (2002). Teachers have seen the IWB as a new tool, but not a piece of technology that would change their practice, reports Levy (2002). Greiffenhagen (2002) further comments that the introduction of new technology was often integrated without difficulty within traditional classroom procedures.

2.3.4 The Promotion of an Interactive Pedagogy

Glover and Miller (2002b) have proposed a pedagogy which moves from a didactic to an interactive situation. With this in mind, it is important to be aware that the concept of interaction as supported by (Ferl, 2005). As opposed to the technical matter of pupils touching the board, he suggested that it includes interactions between pupil and teacher, pupil and pupil, and cognitive interaction with the content of the lesson. These latter forms are possible without an IWB from reviewing the literature. This raises the question as to whether an interactive whiteboard encourages these forms of interaction or not, (Becta, 2007).

Glover and Miller (2004a) and Pearson et al. (2004) propose stages through which use of the interactive whiteboard evolves.

- 'Supportive didactic': uses the interactive whiteboard tool for presentation purposes.
- 'Interactive': is when teachers challenge pupils to think, but only using illustrations.
- 'Enhanced interactive': teachers use the interactive whiteboard as an important part of their lessons most of the time. They are aware of the potential of the board, and aim to stimulate pupils' cognitive development.

Similar stages of interactivity have been developed by other researchers. Tanner et al., (2005), developing the ideas of Hargreaves et al., (2003), created a scale which goes from surface to deep interaction. They argue that demands for pace were generated as a result of whole class discussions. As a consequence, this in turn reduces the opportunity for pupils to reflect at their own pace.

Kennewell and Beauchamp (2003) and Beauchamp and Parkinson (2005) discuss an image of 'scaffolding', based on the socio-cultural theories of Vygotsky (1978). They examined the flexibility of teachers to question, challenge and support the children's own thinking. Hennessy et al. (2005), in a case study of science lessons, found that,

in five out of six lessons observed, pupils rarely touched the whiteboard. In order to maintain the pace of the lesson, the teachers often recorded the children's contributions for them. She queried whether the 'cognitive engagement' of the whole class was more important than physically interacting with the board.

Higgins et al (2005) discovered that in lessons when IWBs were used, the average amount of group work in both literacy and numeracy reduced by seven and a half minutes compared to lessons where interactive whiteboards were not used. He concluded that the 'patterns of interaction' in lessons were the same in lessons which used an IWB and in lessons which did not.

In a later paper about the same study, Smith et al. (2006) argued that hardly any change had occurred. Although there were more open questions and the pace of the lessons increased, the children's answers were shorter.

2.3.5 Factors which challenge and support IWB use

As teachers become more confident in their use of IWB and as they recognise the link to pedagogical change, the IWB becomes a potential catalyst for further change, Miller et al (2004b). Carr (1999) considers whole-class use of the technology and some of the constraints of classroom management which may occur. On the other hand, Clemens at al. (2001) highlighted when an IWB was used with very young low-attaining pupils a number of benefits for learning occurred.

Lewin et al., (2003) argued that there is a requirement for more flexible curricula and pupil / teacher roles, in order to get benefits of ICT. Hall and Higgins, (2005) suggested that the extent in which interactive pedagogies which can be created with an IWB can also be reduced. This is due to the pressure to get through the content of the curriculum, in particular in the secondary school context. On the other hand, Ferl (2005) argues that IWBs actually allow for better classroom management because it accommodates front of class teaching.

Other research has proposed that enhancing collaboration within small groups, is one advantage of the interactive whiteboard, according to Brown (2004) and Witzenried (2004). This type of co-operative learning allows the development of 'multiple perspectives', whereby the children learn from each other in small groups, (Hooper & Rieber, 1995).

It can be concluded from the research literature that a lot of factors play a crucial role in the success or failure of IWBs in schools. Becta (2007) lists some critical factors for the effective use of IWBs. Among these are provision of continued professional development, training and ongoing technical support to teachers and schools to meet their individual needs, (Higgins et al., 2005; Winzenried, 2006).

Indeed, many studies highlight the crucial nature of professional development, which in turn signal *how* the teacher uses the IWB as being far more important than the nature of the technology, (Hooper & Rieber, 1995).

2.4 Professional Development and Response to Change

2.4.1 The Concept of Professional Development

Within the literature, a definition of teacher development is almost entirely absent. Evans (2007) notes that the leading writers in the area of professional development do not even precisely define what they mean by the term. Both Darling-Hammond (1994), and Hargreaves and Fullan (1992) likewise fail to provide definitions of teacher development or of professional development. However, the only relevant definition that is available is proposed by Day (1999).

> Professional development is the process by which, alone and with others, teachers review, renew and extend their commitment as change agents to the moral purposes of teaching; and by which they acquire and develop critically the knowledge, skills, planning and practice with children, young people and colleagues through each phase of their teaching lives.
> (Day, 1999, p.64).

2.4.2 Professional Change

According to Flores (2005), the need to raises educational standards and the issue of quality has become a major priority for governments worldwide. In the literature, the most recent changes in the teaching profession as proposed by Day (1999) and Helsby (1999) have been intensification and bureaucratisation, increased managerialism, greater accountability and public scrutiny.

A study conducted by Flores (2005), found that the Portuguese educational system in the last decade has undergone change similar to that of the Irish context. Although teachers have been dealing with greater responsibilities and demands, the training and support provided to them are far from being responsive to their needs.

Consequently, Hargreaves (1994) comments that it is important to understand how teachers change, why they resist change and why they alter the 'process of change', in which they play a key role. Fullan (1993) introduces the terminology the 'phenomenology of change' and he emphasises the need to take into account the way in which 'people actually experience change as distinct from how it might have been intended', (Fullan, 1991, p.4). With this in mind, Stephens et al. (1993) assert that:

> if we want to improve schools, then, it is important to understand more about teachers and about the role they play. It is also important to understand how teachers change and grow so that we, as teachers and teacher educators, can make informed decisions about how best to support the change process. (Stephens, 1993, p.2).

Helsby (1999) points out teachers vary considerably in their response to change. While some may restructure imposed change in order to fit in with their own views of teaching, others may not. She concludes that whatever structural changes occur, teacher's pedagogical decisions are dependent on their own professional beliefs and levels of professional confidence. Consequently, there are three important considerations in relation to IWB implementation, if it is to give rise to a change in pedagogy:

- The culture in which the technology is introduced

- The beliefs and confidence of individual teachers as they implement change
- The support of management in any implementation

In order for change to occur teachers need to be given support and encouragement, as it is a difficult and gradual process, Guskey (1986). Stephens et al., (1993), suggest that teacher change is a lifelong process of professional growth and also involves values, beliefs and practices. Although, research conducted in the literature asserts that individual teachers quite often change even in situations which are not supportive. However, other teachers do not necessarily change, despite alterations taking place in the organisational setting in which they work, (Richardson & Placer, 2001).

Evans (2007) believes that a commitment to reform-imposed change often referred to as attitudinal development, will evolve over a period of time. She further suggests that,

> This will only take place through a combined process of gradual erosion of resilient attitudes and the continual regenerative process of replacing established staff with newcomers who have never known anything other than the 'new' practice, until the 'new' eventually becomes the norm that defines the comfort zone within which people are happy to work. This, though, being a slow and protracted process, represents evolution rather implementation of change, (Evans, 2007, p.32)

2.4.3 Teacher Professionalism

The concept of teacher professionalism is one which is constantly evolving, Helsby (1999). She states that:

> There is nothing simple or static about the concept of teacher professionalism: it is constantly changing and constantly being redefined in different ways and at different times to serve different interests, (Helsby, 1999, p.98).

Flores (2005) asserts that teacher's views of professionalism, is dependent upon how teachers assess their work and how they reflect on themselves as professionals. Mc Culloch et al., (2000) further endorse these views.

> Educational improvement depends on teachers wanting to make a difference. It depends upon their feeling professional. Neither raising standards by regulation nor professionalising

> by prescription will work. Teachers have power in the sense that they have to want improvement for improvement to happen, (Mc Culloch, 2000, p.118).

Whitty (2000), through an examination of reforms in England and Wales has observed many different and contradictory elements. He suggests that there is an existence of different kinds of teacher 'professionalisms'. These involve different views of being a teacher and of looking at the changing nature of teaching. The key issue in redefining teacher professionalism is the meanings that they ascribe to their daily work in schools. He comments,

> At the end of the day, teacher professionalism is what teachers and others experience it as being, not what policy makers and others assert it should become. The experience of professionalism and of its denial are to be found by studying the everyday work of teaching, (Whitty, 2000, p.293)

Therefore, Flores (2005) believes it is important to understand the ways in which teachers deal with the change process and the subsequent impact of change initiatives on their beliefs and values as teachers. Fullan (1993) extends this further by suggesting a new mind set would need to occur where teachers play a major role as change agents in schools. He states that teachers are encountered with a variety of challenges and need to be trained to deal with them.

Therefore, it is 'crucial that they are involved in the process of curriculum change as developers as opposed to implementers of the directives', (Fullan, 1993, p.3)

A number of increasing demands have been placed upon teachers and schools, consequently the support and resources allocated to them are not responsive to their needs, (Flores, 2005). He suggests that 'teacher education programmes still do not respond adequately to the changing nature of teaching which, more than ever, calls for high quality teachers', (Flores, 2005, p.408).

2.4.4 Changes to Professionalism in Medical Education

The teaching profession is not the only profession to experience challenges within in its ranks. The medical profession has also experienced similar challenges in its professional development in the last few years. In order to assess how these

challenges within the profession could be resolved, they addressed the following three broad areas:

- Improving the selection of future doctors
- Improving the formal instruction of their learners
- Purging their own learning environments of unprofessional practices

(Cohen, 2006, p.610)

The outcome from their findings suggested that the admissions committees over emphasised academic achievement and did not take into consideration non cognitive qualities. The qualities such as leadership skills, motivation and commitment to service might be more indicative of an applicant's potential to become a 'good' doctor, (Cohen, 2006)

As a consequence, admissions committees established thresholds of GPAs and MCAT scores. This approach permitted admission committees to examine closely the personality and character constraints of each applicant, (Cohen, 2006).

2.4.5 Professional Development of Teachers with Technology

In other parts of the world, technology in education has caused widespread difficulties amongst teachers in primary education, Stein et al., (1999). This has been a consequence of teacher's limited understanding of technology and their lack of specific tool and practice skills (Rennie & Jarvis, 1994).

Schulman (1987) recommends that teacher education, which includes professional development, should help teachers to think and question their teaching role.
He points out that it is

> the subject matter and the associated pedagogical content knowledge that hold real challenges for teachers. They must in turn learn about an innovation and somehow convert their knowledge into a pedagogical form,
>
> (Schulman, 1987, cited in Stein et al., 1999, p. 14)

In the literature, it can be seen in the last decade that a variety of descriptions of professional development have emerged. During the stages of teacher professional development, a number of researchers have identified many complexities in the changes that are taking place, Stein et al., (1999). Hargreaves and Fullan (1992) recognise teacher development as a process of knowledge and skill development. This highlights the development of the person and the context in the process of teacher change.

In support of this, Joyce and Showers (1988) take a similar perspective that professional development is most effective,

> when it is looked at in terms of individual needs, the needs of the schools and systems, the particular learning programs in place, and the students, their needs, abilities and characteristics, (Joyce & Showers, 1988, p.76)

Guskey (1986) introduced a model of effective staff development. It focused on elements which encourage and support teacher change. This model shows that if teachers are encouraged to adjust their practice and experience improvement in student learning then change may occur.

However, within these models and descriptions, a number of underlying themes have been recognisable within the literature.

1. Planning for professional development - teachers' existing beliefs and knowledge need to be taken into consideration. These will influence the views the teachers have regarding an innovation and the sense they make of it.

2. Non- critical assistance and support. This can be invaluable for facilitating teachers' review and reflection upon their own practices and beliefs.

3. Opportunities to engage in professional dialogue with colleagues in similar situations. By facing similar challenges, encouragement, support and critical friendships can be generated.

4. Teachers need to feel a sense of responsibility for their own learning and development.

5. Time, space and opportunity are needed for teachers to experiment with ideas. This will allow them to reflect upon their experiences.

(Stein, 1999, p.2)

Although, all the descriptions and models refer to the process of teacher change in general, the integration of technology within education is a new learning area for many primary school teachers, (Stein, 1999). A number of changes and challenges that this creates for the teaching profession have been noted by Banks' (1996). He has recognised the importance 'teachers' personal subject construct knowledge has in underpinning the whole range of their professional knowledge about technology', (Banks, 1996, p.177).

He states,

> Personal construct knowledge influences, and is influenced by, teachers' school knowledge, or their understanding of how technology within the classroom is different from technology in the outside world; their curricular knowledge, or their awareness of the different types of technology tasks; their subject matter or content knowledge; and their pedagogical content knowledge, (Bank, 1996, p.176)

Jones and Compton (1998) follow a similar perspective. Their research examined the experiences of teachers implementing technology in education in New Zealand. This led them to develop a model for professional development. It illustrated how the implementation of technology in the classroom was dependent upon the professional knowledge and understandings of the teachers. They further suggest that

> these developing understandings will be influenced and determined by the teachers' prior experiences and social positioning, and that professional development experiences should include opportunities for teachers to reflect on their own and others' technological practice, upon the concept of technology itself and upon general pedagogical knowledge, (Jones & Compton, 1998, p.58).

They have concluded that in order for teachers to become effective educators with technology, they must be allowed to develop 'an understanding of technological practice, an appropriate concept of technology, and an understanding of technology pedagogy', (Jones & Compton, 1998, p.56).

2.5 Conclusion

Within the last decade, Irish society has undergone widespread social, cultural and technological change. In the Information Age in which we live in, there have been numerous innovations in the way in which technology has made information readily available to us. Therefore, it has been important that individuals are equipped with the skills necessary to exist in such a knowledge based environment. Consequently, the potential of IWBs to change the teaching and learning process has become a major debate among many researchers, (DES, 2008).

The introduction of the IWB into the education system has created an interesting insight into its influence in the primary classroom. According to some reports, there have been some changes in pedagogy, whereby it has increased interactivity and active learning in the classroom. However, in other instances, research has indicated that there have been no significant changes in pedagogy. An important feature of the revised curriculum is the development of collaborative learning. However, the question emerging from the literature is whether an IWB can encourage collaborative or cognitive development any more significantly than an environment without an IWB, (Hennessey et al., 2005).

It can be seen that teacher-only operation of the IWB retains teacher control and avoids reducing pace of the lesson. As a consequence of pace being reduced, a didactic teaching environment tends to be created. The concern in maintaining lesson pace means that IWB use may allow even less thinking time and opportunity for child discussion than other forms of educational technology, (Hall & Higgins, 2005).

Within the literature, the research has indicated that that teacher choice of technology is related to their beliefs of teaching. Consequently, the introduction of new tools does not drive pedagogical change. It creates an evolutionary process whereby existing practices tend to interact with these tools . However, it remains to be seen, if the potential benefits of IWBs in re-shaping pedagogy become apparent when professional development evolves, (Hennessey et al., 2005).

Chapter 3 – Methodology

3.1 Overview of Research

The principle aim of this study was to investigate whether the IWB in an Irish Primary classroom has an influence on teacher's pedagogy. In Chapter 2, the author has illustrated the findings as presented by researchers in this particular field. This Chapter will generate a methodology which it is hoped will examine the way IWBs have influenced pedagogy within the classroom in a small rural school in the West of Ireland.

3.2 Research Methodology

3.2.1 Aims/Objectives of the Research

The principle objectives in conducting this research are as follows. It is intended to examine whether the introduction of the IWB in the primary classroom has been a factor in altering the pedagogy of the teacher within the classroom. Also, what underlying factors if any have played a key role in influencing their pedagogy.

In order to assist in determining the research instruments to be used in the study, the following research questions have been formulated.

- Has their pedagogy changed totally or has it remained the same?
- What are their attitudes towards the use of the IWB and has it benefited their pedagogy in any way that was not achievable previously?
- What challenges if any within an educational context, influence the use of IWBs within their pedagogy?
- Has the presence of the IWB led to a change in the level of professional development among the teachers in the school?

3.2.2 Introduction

The main emphasis in this research was to examine how the teacher's pedagogy has been influenced or not by the introduction of the IWB in the classroom. With this in mind, a number of research paradigms were examined by the author in which both the positive and negatives aspects of the paradigms were assessed.

Initially, the concept of action research was examined. In order to define action research, Hopkins and Ebbutt (1985) comment that it is a form of disciplined inquiry in which a personal attempt is made to understand, improve and reform practice. However, Kemmis and Mc Taggart (1992) further suggest that it is concerned with changing individuals and in turn, the culture of the groups and institutions to which they belong.

There are several claims for action research amongst teachers. It changes their beliefs and broadens their views on teaching, (Noffke & Zeichner, 1987). Jean McNiff (2001) has conducted considerable work in the area of action research and states that in order for change to take place, it requires an enquiry into one's own practice. She comments

> the self studies the self. It is therefore important to gather data about one's own practice, and the practices of others with whom one is working, to change a situation, (McNiff, 2001, [Online]).

However, within the context of this small study, the observation of Zuber-Skerritt (1996) is most relevant. As they believe that within a small scale study, action research techniques would not be specific enough to lead to genuinely new insights. Therefore, in order to 'capture the dynamics of unfolding situations' as supported by (Nisbet and Watt, 1984, p.84), it was proposed to conduct a Case Study.

The use of Case studies in areas of research has been widely supported in recent times, in that it can provide a unique example of real people in real situations. They can also permeate situations in ways that are not always susceptible to numerical analysis, (Cohen et al, 2004). By examining the research question through the use of

a Case Study, it was believed that it would show the close up reality of a participant's thoughts and feelings about the situation, (Cohen et al, 2004).

A limitation of a case study according to Nisbet & Watt (1984), is that they are not easily open to cross referencing. Therefore, they may be 'selective, biased, personal and subjective in some instances', (Nisbet & Watt, 1984, p.54).

3.2.3 The Setting

The research was carried out during the period January to June 2009, in a rural three teacher school in the West of Ireland. The school's enrolment at the time of study consisted of fifty-four pupils. Within this setting, the teachers and pupils were part of a multi-class teaching/learning environment. In terms of ICT literacy, the school had made considerable progress within the last two years. During this time, it had acquired ICT equipment through their fund-raising activities. Each classroom had an IWB at its disposal, along with four desktop computers and peripherals located within each classroom.

All children from Junior Infants through to Sixth Class received access to ICT education on a weekly basis, as per the school's ICT policy. The School was also in the process of conducting preliminary work in relation to Digital School's Status. This is a national award which is achieved by schools that have made a considerable effort to incorporate ICT into their daily curriculum, (Digital Schools, 2009).

3.2.4 The Participants

The principle objective was to examine the role of the IWB as a catalyst for pedagogic change amongst teachers. The focus of this study centred around the pedagogy of two mainstream teachers. They are defined as Teacher (A) and Teacher (B) for issues of confidentiality. Both teachers had a reasonable level of ICT skill, had completed ICT summer courses in the last few years which are referenced in table 3.1. The children who participated in the study were the junior classes comprising of 15 children and the senior classes which comprised of 18 children.

Table 3.1 – ICT courses completed by Teachers

Teacher	ICT Course Completed
A	*ICT and the Primary Curriculum*
	Internet Safety
	ICT and Education
	PowerPoint, the Curriculum and E-planning
B	*ICT and the Primary Curriculum*
	Interactive whiteboards in the Primary School

3.2.5 Research Methodology & Rationale

As the research involved a case study, information from a variety of sources was used to assist in the data collection process. A questionnaire is a widely used instrument for collecting survey information. In turn it provides structured data which can often be administered without the presence of the researcher, (Wilson & McLean, 1994). However, one of the main issues considering the reliability and validity of questionnaire surveys is the issue of the sample size. As the sample of teachers in the study was small, the questionnaire would not have been an appropriate instrument to have chosen.

Consequently, the data necessary for this study was collected from several sources of a qualitative and quantitative nature. In order to obtain information related to the key research questions, it was felt that a semi-structured, open-ended interview approach was suitable.

It was also proposed that an observation schedule would also be used, in order to assess how the IWB may have influenced the teacher's pedagogy. An observation schedule allows the researcher to make comparisons between settings and situations and trends. On the other hand, a concern with an observation schedule is that the method does not take into account the intentions of those being observed, (Cohen et al., 2004).

An adapted version of the SCOTS schedule for teaching strategies was used in the study, (Powell, 1977). The subsequent observation data from both the junior and senior classes was also collected and analysed. To ensure triangulation of the data, it was proposed that monthly progress reports, planning documents and IEPs from the teachers and any additional documentary evidence would be examined.

3.2.6 Data Analysis

The analysis of the interviews was conducted while using the stages of an interview investigation as supported by Kvale (1996). This involved transcribing, analysing the information and coding it under themes, verifying and reporting the information. This was detailed in the findings in Chapter 4.

In terms of analysis of observation, notes were made that were based on specific or pre-determined themes as supported by Lincoln and Guba (1985). The themes generated from the interviews were used as observation pointers, which would be used to assist in the use of the observation schedule in the classroom..

3.3 Research Instruments

3.3.1 Interviews

The main reason to have chosen the semi structured interview instrument is that it offered flexibility to obtain information from the interviewee. According to Cohen et al., (2004), it 'can be used as the main means of obtaining information which in turn

has a direct influence on the research objectives', (Cohen et al., 2004, p.268). Tuckman (1972) also comments

> by providing access to what is inside a person's head, it makes it possible to measure what a person knows, what a person likes or dislikes and what a person thinks (attitudes and beliefs), (Tuckman, 1972 cited in Cohen et al., 2004, p.268).

An open ended approach to questioning, allowed the author greater flexibility in sequencing and wording the questions. However, in a structured approach there is little freedom to make modifications, (Kerlinger, 1970).

The other reason for choosing the interview method as opposed to the questionnaire was that the interviewer is able to answer questions concerning the purpose of the interview and any misunderstandings the interviewee may experience. If open type questions were used in a questionnaire, there is the possibility that for a variety of reasons, people might be unwilling to write their answers, (Cohen et al., 2004).

One advantage of the interview situation as a method of data collection is that it allows for greater depth than other methods of data collection. Oppenheim (1992) suggests that

> interviews have a higher response rate than questionnaires because respondents become more involved and hence, motivated. They enable more to be said about the research than is usually mentioned in a covering letter to questionnaire, and they are better than questionnaires for handling more difficult open ended questions, (Oppenheim, 1992, p.269)

A disadvantage on the other hand is that the wording of questions can often result in different responses. In that case, it would reduce comparability of responses. Therefore, it was proposed to pilot the interview questions on a selection of teachers who were not taking place in the study. Revisions were made based upon their comments and findings.

3.3.2 Conducting of Interviews

The interviews were conducted prior to the lesson observations. The reason for this was to identify the approaches and ways in which the teachers were using the IWB and to possibly identify if it had influenced their pedagogy.

They also examined the teacher's attitudes towards ICT in general and in their teaching and to discover what approaches they have made towards up skilling in the area. Subsequent questioning hoped to identify how their teaching had changed within the classroom context and how their planning and preparation may have been affected. The interview questions can be referenced in Appendix E.

3.3.3 Observation

It was intended to conduct classroom observation as the second component of the study. Within the areas of research, observational data is considered attractive as it affords the researcher the opportunity to collect 'live' data from 'live' situations, (Cohen et al., 2004). This is supported by Patton (1990) who comments that, it enables the researcher to examine what is taking place in front of them rather than at 'second hand'.

In order to decide on the observation to use, both structured and unstructured observation methods were considered carefully. A structured observation will know what and will have its observation categories worked out in advance. In contrast to this, a semi structured observation will be less clear about what it is looking for in the research. In general, It is hypothesis generating rather than hypothesis testing, (Cohen et al., 2004).

Consequently, it was proposed that a structured observation schedule using an adapted version of the system for the classroom observation of teaching strategies (SCOTS) schedule by John Powell (1977), would be used in the study. The author measured the teachers under observation using a five point scale. This examined topics such as 1. Teaching Skills, 2. Development of Responsibility and 3. Grouping Practices, which can be referenced in Appendix D. The reason why these areas were chosen was that they were more suitable to the research question which was to examine the concept of pedagogy within the classroom. The observation in the classroom consisted of one lesson from both the junior and senior classes.

3.3.4 Documentary Evidence & Triangulation

In order to make more in depth comparisons of the data, it was proposed to obtain data collection from documents and records within the study. Cohen at al (2004), comment that the attraction of documentary evidence is that they are considered factual and often an unobtrusive method of data collection. Lincoln and Guba (1985), also agree that the collection of data from non-human sources such as documents has the attraction of being available and factual. However, in contrast to this, Platt (1981) comments that there are often difficulties in terms of accessing documents, interpretation and authenticity.

The instruments of observation interviews, analysis of the interview data, observation findings, and subsequent discussion of the findings in the data would allow for a more accurate and objective analysis in the research.

The concept of triangulation of data as stated by Cohen et al (2004) is, 'the use of two or more methods of data collection in the study of some aspect of human behaviour', (Cohen et al., 2004, p. 112). Without the process of triangulation, there would be questions over the reliability of the data. The need for triangulation was further supported by in the literature by Campbell & Fiske (1959) where they state that, 'it is also a powerful way of demonstrating concurrent validity, particularly in qualitative research' (Campbell & Fiske, 1959, p.97).

In order to triangulate the data, an analysis of the teacher's monthly progress reports and any other schemes or documents available, would be used to examine any changes in teaching methodologies as a result of the introduction of the IWBs.

3.4 Potential Weaknesses of the Study

An area in which the author had concerns was regarding the sensitivity of data. Lee (1993) had commented about the problems of conducting interviews where the researcher is researching sensitive subjects. As highlighted in the literature review, teaching is a professional discipline and some of the teachers in the research may not

like their professional life to be questioned. In this instance, the interview might be seen as an intrusion into their professional lives. This is further supported by Cicourel (1964) who noted that sometimes avoidance tactics may be adopted if the questioning becomes too deep.

In terms of the observation in the classroom environment, the author had concern regarding reactivity within the situation, sometimes known as the Hawthorne effect. This is where the presence of a researcher in the test environment may alter the situation. For example, according to Cohen et al., (2004), the study sample 'may impress, deny or influence the researcher', (Cohen et al., 2004, p.156). However, in order to negotiate around this issue, the researcher tried to remain in the field for a considerable time before the observation took place.

The original SCOTS observation schedule created by Powell (1977) had 48 statements originally and this was narrowed down to 10, given the limited nature of the study. The movement from low to a higher degree of inference can generate a certain degree of bias by the researcher. Therefore, the additional methods of data collection were employed to provide triangulation.

Given the limited size of the study, it was not intended to generalise the findings found to reflect what was happening at a national level. It was more of an indication of what was happening within the sample study.

It was important to be aware that the availability of documentary evidence can influence the research conducted. This may be the case if there are a limited number of documents. There was also the possibility that documentation may be unrepresentative or deliberately deceptive, (Finnegan, 1996).

3.5 Ethical and Confidentiality Considerations

Researchers have a responsibility not only in their quest for knowledge, but also for the subjects that they depend upon for their work. They need to take into account the effects that research may have on its participants. Consequently, they need to respect the dignity of these people, (Cohen et al, 2004).

This is known as Ethical Behaviour. Ethics can be defined as

> a matter of principled sensitivity to the rights of others. Being ethical limits the choices we can make in the pursuit of truth. Ethics say that while truth is good, respect for human dignity is better, even if, in the extreme case, the respect of human nature leaves one ignorant of human nature, (Cavan, 1977, p.810)

- Prior to conducting research in the school, written permission was requested. This letter in Appendix A was submitted to the school, outlining the research and stages involved.

- Subsequently, a consent letter in Appendix B was sent to each participating teacher. It requested permission from them for their contribution to the research. This was to involve teacher / author interviews and teaching observation.

- The school was guaranteed confidentiality in all letters of contact to the school.

- Likewise, all parents/guardians of the children in the classes of observation were forwarded a consent form in Appendix C.

- The teachers were assured that all references to the parties involved would be removed and pseudonyms would be used in order to prevent identification.

Chapter 4 – Research Findings

4.1 Introduction

This chapter presents the findings of the research study. The data was obtained from two sources, mainly interviews and classroom observation. In this small case study, the two mainstream teachers provided an account of their views of the IWB and its influence on their pedagogy. The teachers were interviewed prior to the classroom observation. The triangulation of data occurred through the examination of documentary evidence within the school.

4.2 Teacher Profile

4.2.1 Teacher A: Senior Classes

Teacher (A) had been working as a primary school teacher for twenty years. This was her first permanent position and prior to this she had been working in schools in a temporary capacity. She had been employed in the research school for sixteen years, nine of which had been as Principal. She had taught all classes throughout her career, but expressed a preference for the more senior classes, she stated,

> it is really more enjoyable working with them as they have a certain knowledge base. They are also fairly eager to do group project work and to also work independently.
>
> (Teacher A)

She considered herself to be a teacher who was flexible and took a keen interest in different methodologies.

> Well, to be honest, I believe I am a teacher who is always open to change. I am always looking for and am interested in new ways and ideas to help children and teachers in their tasks. (Teacher A)

She further described the qualities which were important for a teacher to have,

> I think motivation is an important factor, because if a teacher is not motivated, then it affects the class in general. It's very important to be consistent on an ongoing basis and to extend fairness across the board. (Teacher A)

4.2.2 Teacher B: Junior Classes

Teacher (B) had thirteen years experience as a primary school teacher. She had been employed in the research school for nine years as Assistant Principal and ICT co-ordinator. Previous to this, she had worked as a substitute teacher in numerous schools, where she felt she gained valuable experience. She had taught all mainstream classes and in a learning support capacity throughout her teaching career. She expressed affection towards the junior classes within education, as she felt

> that age group can be easier to deal with than older children. Although, it is quite challenging as you're kept going and can be quite drained by the time the day is finished.
>
> (Teacher B)

She considered herself to be a teacher who encompassed a wide variety of qualities.

> I try to be aware of children's needs, I guess I'm consistent, fair, have a sense of humour and am patient. Well I try any way!... (Teacher B … laughs)

She described the qualities which were important for a teacher to possesses as,

> in patience, a sense of humour, caring and possibly the ability to multi task especially in the multi-class situation. (Teacher B)

4.3 Attitudes towards ICT within the School

Teacher (A) discussed how after conducting one of her first summer courses, that the idea of introducing ICT within the school was initially developed.

> I really could see the potential of ICT in general after doing it. It was then a case of looking at ways in which we could try to purchase the equipment for the school.
>
> (Teacher A)

She mentioned that she was proud of the steps that the school had made in the last two years regarding the role of ICT in the school. She stated,

> I suppose we are really fortunate in that we have a supportive BOM that genuinely encourages staff development. The Chairperson is really into I.T. and has been a major help in the fundraising and purchasing of all the equipment and whiteboards in the school. I think that the application for digital schools status has encouraged all of us to use the equipment more productively than some might have otherwise used it.
>
> (Teacher A)

The way in which ICT within the curriculum has the potential to improve the way teaching and learning takes place, was something that she felt should not be ignored.

> Well firstly it is more visually appealing and anything which has the whole wow factor has the tendency to attract children for longer periods. So, essentially that is a really good start. I feel that it is quite beneficial for teaching where there are different learning styles and especially within the areas of special needs.
>
> (Teacher A)

Teacher (B) also believed that ICT helps in the way teaching takes place. Although, she felt that it was not a more successful way. She commented,

> Certainly, its an excellent way to encourage learning, but its not a better way to deliver the curriculum. There are other methodologies which are as good if not better than ICT and they cannot really be ignored.
>
> (Teacher B)

She believed that ICT's role in the school was more evident than what she believed one would normally expect to find in a rural school.

> We are different from other schools in that we have a BOM that have been a huge support to the Principal in trying to encourage new ways of teaching and learning.
>
> (Teacher B)

4.3.1 Early Days and the IWB Introduction

Prior to the introduction of the IWB, Teacher (A) had commented on the use of traditional methods of teaching.

> Well, in the days before whiteboards, I tended to have an over reliance on textbooks and using what you would now call the traditional whiteboards. My main aim always has been to make the learning experience reasonably enjoyable and creative for all the children.

> I would have used a lot of hands on materials etc., as you know children all learn in different ways.
>
> (Teacher A)

On her first use of the IWB, she mentioned the difficulties she encountered.

> The ability to be able to click on certain websites and be transported to far off places was fantastic. It was great until the thing seemed to go a bit crazy. (Teacher A, shakes head)
>
> I was clicking on things and nothing was happening. It was panic stations really for a few minutes, but in fairness to the kids they were a great help in offering ideas as to what could be done to get it working again.
>
> Sometimes it was a case of staying back after school to get the hang of it, but once I got more comfortable and bounced my concerns off others, it became second nature afterwards really. (Teacher A)

In the last few years she had undertaken a number of summer training courses in the area of ICT. More recently, she had completed a course on Powerpoint and the Curriculum. She felt that this course was beneficial particularly within the areas of S.E.S.E and the Arts.

> As I am very interested in music, I created one on instruments of the orchestra which I used in the class this year. The children really enjoyed it as I was able to bring in the sounds as well. I know there was a bit of work involved, but without ICT I think it would have been difficult to carry out that particular lesson. (Teacher A)

She had felt the introduction of the IWB had allowed her to incorporate websites and visuals into her lessons that were not previously possible. She felt that it had helped in her planning and preparation, as the feature allowed her to tend to check out the resources prior to the lesson.

However, she spoke of the challenges encountered in accessing resources.

> Although there is a lot of good stuff there, I find I spend a lot of time looking for resources. I think there needs to be more informed access to information and material available to teachers. (Teacher A)

In the early days, before the IWB was introduced into the classroom. Teacher (B) expressed that her teaching involved the use of a lot of resource material.

> Before hand, I would have used to use a lot of fearas or materials. It was the only way at the time and very time consuming. (Teacher B)

Her first experiences of the whiteboard, led her to suggest

> For the first while, it was difficult as we received no formal training from anyone, so it was a case of trial and error really.
>
> I did an IWB summer course the end of the first year, but I felt I had already got to terms with it at that point. (Teacher B)

She expressed relief at the benefits it had brought to her classroom.

> There has been less time spent making resources like charts and pictures and the size of the screen has helped all the children in the class to see what's going on at the same time.
>
> (Teacher B)

Although, she had felt that there were also some concerns.

> A lot of time can be spent looking for web sites and things like that and a good deal of planning would be involved incorporating these into a person's lessons.
>
> (Teacher B)

4.4 Pedagogy within the Classroom

Teacher (A) mentioned that the IWB had not altogether changed the way in which she had taught.

> I have always tried to incorporate an interactive approach to my teaching. By this I mean that I encourage group work and discovery learning as best as I can. I feel that the whiteboard complements my teaching style. The access to an availability of resources which it provides, I feel has assisted in this approach.
>
> (Teacher A)

Although, Teacher (A) had full time access to an IWB in her classroom, she did admit to not using it for all her teaching day.

> Although it is a truly beneficial resource, I feel that it is difficult to use for most of the day. Well, as it's a multi-class situation, a lot of organising and planning would need to be involved to use it for each curricular area. I still would use other resources as well in my daily teaching. (Teacher A)

She stated that the revised curriculum had placed extra demands on her as a teacher.

> In a multiclass situation it is more difficult, as I feel that there is a juggling of timetabling on an on-going basis. (Teacher A)

There is one curricular area that she believed had benefited from the introduction of the IWB in her classroom.

> In the area of S.E.S.E, I really don't know myself in the last while. There are lots of sites that you can access in only a few seconds. These sites have lots of visuals and videos which can be used as a stimulus in lessons. (Teacher A)

Teacher (B) felt that the IWB had not changed her teaching and did not use it all through her teaching day.

> It probably allows me more freedom to introduce things into my lessons that I mightn't have been able to do before. The revised curriculum has also put huge pressure on us, but in general I feel that I've adapted it within my existing practice.
>
> I know there is a lot of talk out there about how great it is. Don't get me wrong, it's probably a good way to teach, but I feel that all the other teaching methodologies are necessary as well. (Teacher B)

Similarly to Teacher (A), she considered that she used the IWB more frequently within the curricular area of S.E.S.E.

> The ability to display pictures of animals and objects within the area of science and geography is a great plus. I also find that I tend to use it more for English, especially for story time. (Teacher B)

4.5 Observation of Lessons

In order to assess whether the IWB had influenced the teacher's pedagogy, each lesson was observed and recorded using the adapted version of the SCOTS (Powell, 1977) rating schedule. This can be referenced in Appendix D. Given the small scale of the study and the time frame involved, it was proposed that one lesson from each teacher would be observed. The findings will be discussed in Chapter 5. The lessons which were observed are identified in tables 4.1 and 4.2 and their progress subsequently outlined.

4.5.1 Outline of Lesson - 1:

The lesson commenced with a Powerpoint presentation of the Burren landscape, prepared by the teacher. It consisted of 14 slides and followed the curriculum strands of Natural and Human environments. The children were initially introduced to the physical landscape of the Burren. After a brief discussion session, the children were questioned as to the environmental concerns they believe existed in the area. As the local government elections were taking place in the subsequent weeks, they were instructed to prepare a presentation which a local councillor might use in their campaign for the protection of the natural environment. Upon completion of the project, each group was requested to make a presentation.

Table: 4.1 - Observation Lesson – 1

Teacher:	A
Lesson topic:	The Burren Landscape
Curriculum Area:	S.E.S.E. – Geography
Duration:	50 minutes

The children were asked to work collaboratively in groups. Each child was assigned a designated role within each group. Subsequently, each group worked on the four computers at the side of the classroom which were all networked.

The author observed them locating graphical images from the internet and accessing images already stored on the network. It was during this point that Teacher (A) acted as an observer, moving from one group to the next while monitoring their progress. The teacher also queried the children regarding the reasons behind their ideas which

were being used in their presentations. The lesson concluded with a summary of what was discussed in the lesson. Presentations were to be scheduled for discussion later in the week.

4.5.2 Outline of Lesson - 2:

The lesson involved a shared reading activity, whereby the teacher used an IWB as opposed to a 'Big Book' approach. The children were shown the digital cover of an online story on the IWB. Teacher (B) asked them to guess the story's title. This was assisted by relating the title to books the children may had experienced before. Following this, attention was drawn to the writers and illustrators names. The teacher asked the children what they thought these people had to do with the story.

Table: 4.2 - Observation Lesson - 2

Teacher:	B
Lesson topic:	Online Story Book
Curriculum Area:	English – Shared Reading
Duration:	Two – 15 minute periods

The teacher then clicked on the forward arrow button at the bottom of the page. She asked the children to watch the pages and to predict the story, by what was happening on each page. At the end of the story, the teacher wrote all the children's suggestions on a flipchart beside the IWB.

In the second part of the lesson, the story was read aloud to the children. During this point, direct questions were posed to the children. At this point, they were asked to

work in pairs/groups to answer the questions posed. Upon completion of the story, the children were asked to look at the chart to see if their predications were correct.

4.6 Access to Documentary Evidence

In order to triangulate the data the author proposed to gain permission, to access documentation within the school to examine the types of pedagogies employed by the teachers. It was found that monthly reports older than two years were not accessible, making it difficult to examine pedagogy prior to the IWB introduction. However, access to reports within the current year was granted. From an observation perspective, the majority of these were not very detailed and the types of teaching methodologies employed were not evident. It was felt that access to both teacher's termly schemes, other planning documents and IEPs would make the analysis process more clearer, however requests for access to these documents was not granted.

4.7 Professional Development

Teacher (A) spoke of her views regarding teaching in that it was a profession seen as one of great care and trust.

> At the forefront, I try to focus on the needs of all the children. This I feel gives rise to the development of new skills and ideas within my teaching.
>
> I have always bared this in mind and I feel that it has influenced my teaching greatly. (Teacher A)

She described her role together with the BOM within the school, as being of considerable importance in terms of encouragement of professional development.

> As Principal, it is important to be seen to encourage the development and furthering of skills that a person has. With this in mind, it is very important that a school has a supportive board of management.
>
> We are very lucky in that the board of management encourages us to take part in any courses if we are interested. (Teacher A)

She further described her views on professional development.

> It is important as it promotes confidence within one's teaching ability. Sometimes confidence can be developed if helped by others, as their skill base can also encourage and motivate. Although, it can be difficult for some people to change, as traditionally they can be very set in their ways.
>
> (Teacher A)

Teaching and the profession was a rewarding, although challenging career according to Teacher (B).

> It's not as straight forward as people make it out to be, but it does have its benefits.
>
> (Teacher B)

Her views on professional development highlighted the extent to which some people were willing to develop their skills in a certain area.

> Generally speaking, it depends on the person's own views, but some people are comfortable and familiar with their own level of ability and may not feel the need to progress their skills.
>
> (Teacher B)

Although, she did not feel that her position within the school encouraged professional development amongst others.

> I don't think my role has any influence on the professional development of others. Although, being Assistant in the school brings a certain degree of responsibility, the final say really comes from the top, but as long as one is carrying their duties to their best ability it shouldn't be a major factor.
>
> (Teacher B)

4.8 Challenges of IWB use within Pedagogy

Teacher (A) commented that training, time management and professional development were the challenges of IWB use within pedagogy.

> There is not enough training readily available for teachers who introduce whiteboards into the classroom. Also, there is very little support from the companies selling the product and also how to use it within the curriculum. The willingness of people to be flexible can also be a challenge in a lot of schools.
>
> The other concern is time management. This depends on how well the lessons are planned, as in some lessons it might be quicker to ask the child the answer orally. Because by the time they come up to the board the pace of the lesson slows down.
>
> (Teacher A)

The lack of training and planning was also seen as the main obstacle in IWB use according to Teacher (B).

> We got no training really other than finding out for ourselves and doing our own courses. We also received no curricular support for its use. This would be the main reason I feel for teachers not using them properly.
>
> Trying to fit a lesson around the board can also be very time consuming, as a lot of preparation is involved.
>
> (Teacher B)

4.9 Conclusion

The teachers in the study had genuinely expressed a number of positives that the use of IWBs could bring to the classroom. Although, they considered it a beneficial resource, they mentioned that it had not altogether changed their pedagogy. It was felt that a number of themes had emerged which had influenced the use of IWBs within their pedagogy. These will be examined in the subsequent chapter.

Chapter 5 – Discussion of Findings

5.1 Introduction

In Chapter 4, the author produced the findings from the research which were based on data obtained from observations and interviews. The main research question examined whether the use of the IWB was a catalyst for pedagogic change. This chapter presents the discussion of findings of the research study. The findings from the research are discussed under different themes, namely Pedagogy in the classroom, Professional Development and Challenges of IWB use within Pedagogy.

5.2 Pedagogy in the Classroom

5.2.1 Post Observation of Lessons

In order to ensure the effective use of IWBs as a pedagogical tool, teachers are considered to play vital roles in its implementation in the classroom, (Rudd, 2007). The teachers within the case study displayed a high level of proficiency and instruction in the observation lessons.

The introduction of the IWBs into the classroom had led to positive responses from both teachers (A) and (B), in terms of the benefits it brought to the classroom. The benefits which they had mentioned in the interviews largely depended upon the pedagogic aims of the lessons. Both lessons conducted a level of interactivity this was exhibited in different ways. Consequently, this had a tendency to impact the type of pedagogy which was observed in both classrooms.

Before an examination of pedagogy of both teachers is conducted, it is important to be aware that both lessons consisted of children of differing age groups and skill-sets.

The group of children in lesson 1 conducted by teacher (A), consisted of children aged 10 to 12 years. The aim of the lesson and the age profile of the children, allowed the teacher to afford the children more control of the lesson. These children were capable of engaging in more independent activities. They were also more capable of being responsible for their own work and engaging more in group activities. These skill-sets in which they developed, allowed them to develop the process of discovery learning and to be critical in their thinking.

In contrast to this, lesson 2 conducted by teacher (B) comprised a group of children aged 5 to 6 years. The lesson was a shared reading activity, whereby the emphasis was predictive story, sight vocabulary and reading skills. This type of lesson necessitated whole-class teaching for the age group. The children at this level would not have been able to conduct the same level of independent learning as those exhibited by the older children.

5.2.2 Teacher's Pedagogical Approaches and IWBs

In order to assess the pedagogical approaches of the teachers, it was interesting to note the views expressed by Glover and Miller (2002b) in the literature. They proposed a three stage pedagogical approach throughout the use of the IWB. It involved the teacher commencing with a didactic approach, which moved to interactive and finally to enhanced interactive approach, as they became familiar with its use.

- **'Supportive didactic':** Where the interactive whiteboard was used solely as a presentational tool.

- **'Interactive':** This was when teachers challenge pupils to think, but only using illustrations.

- **'Enhanced interactive':** Where the teachers used the IWB as an integral part of their lessons most of the time. They were aware of the potential of the board, and tried to stimulate pupils' cognitive development.

The observations were conducted using an adapted version of the SCOTS rating schedule Powell (1977), which was referenced in Appendix D.

Subsequently, it was cross checked with the pedagogical approaches as proposed by Glover and Miller (2002b). As the course of observations was limited in duration, it was important to note that the findings did not reflect a conclusive movement throughout the pedagogic stages for each teacher. It was also difficult to conduct a comparative study between both lessons as they were aimed at different age group levels.

However, in the lessons observed, the IWBs were used to reinforce a whole class teaching style, whereby both teachers (A) and (B) taught from the front of the classroom. This would concur with the views of OFSTED (2002) in the literature, whereby they reported that the IWB allowed the use of ICT for front of class teaching. This in turn may have alleviated the teacher's feelings of loss of control.

Teacher (A) taught a lesson which was interesting for the age group and allowed for independent learning. The lesson conducted by Teacher (B) lesson was also age appropriate, and encouraged independent co-operative learning but within a different context. Both teachers had also showed a high level of preparation and planning within their lessons.

In terms of the extent of the control of pupil's learning activities, both teachers initially commenced both lessons with a didactic approach. This would concur with Beeland's (2002) views that lessons which were most positive were where teachers made the most use of the facility to present multimedia resources. However, throughout the course of the lessons this developed to the next stage which was interactive. Both teachers showed control of the children's learning activities to the extent that the children were able to work independently. The results could be observed below in figure 5.1.

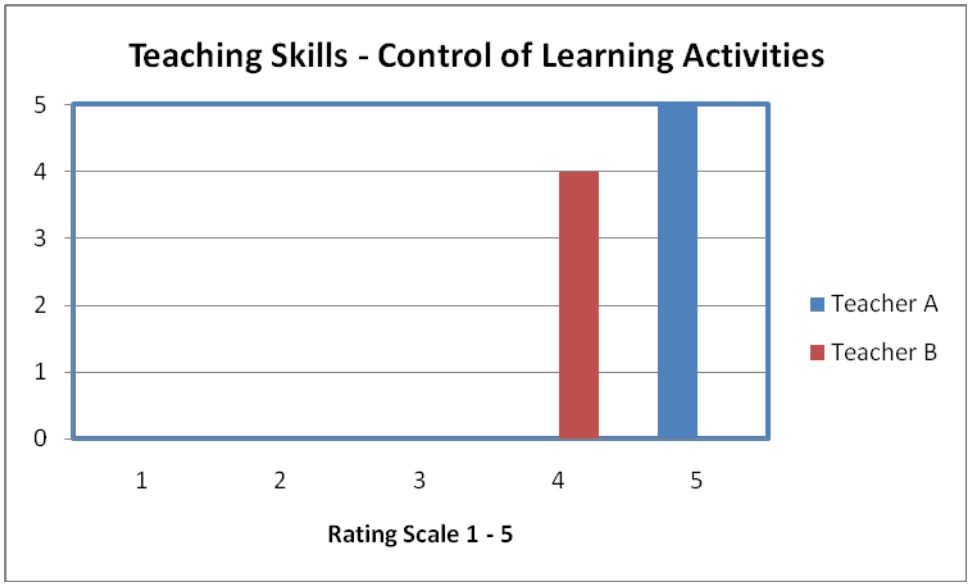

Figure 5.1: Teaching Skills – Control of Learning Activities

5.2.3 Development of Children's Critical Thinking

Throughout the course of observation lesson 1, Teacher (A) was observed questioning the children at different intervals, as to the reasons for their approaches in their group tasks. Kennewell and Beauchamp (2003) discussed the ability of teachers to question and challenge children's thinking led to the development of interactive thinking. This concept of scaffolding was based around the ideas of Vygotsky (1978) and this developmental approach concurred with the view of Smyth (1999), who proposed that ICT was an important tool in facilitating group work and collaboration. They further commented that this type of learning could promote critical thinking.

This level of critical thinking was also evident in observation lesson 2 conducted by Teacher (B), even though the extent of co-operative work varied due to the pedagogical aims of the lesson. Levy (2002) had commented that the IWB can lead to an enhancement in pupil-teacher interaction. He stated by

> encouraging children to answer questions, which if correct can be noted on a flipchart, is often supported by the strong visual appeal of the learning resources being displayed, (Levy, 2002, p.4).

Neither teacher (A) or (B) had reached the enhanced interactive stage, as both teachers had mentioned that they 'did not use the board as an integral part of their lessons all day', according to Glover and Miller (2002b). The results could be observed in figure 5.2 below.

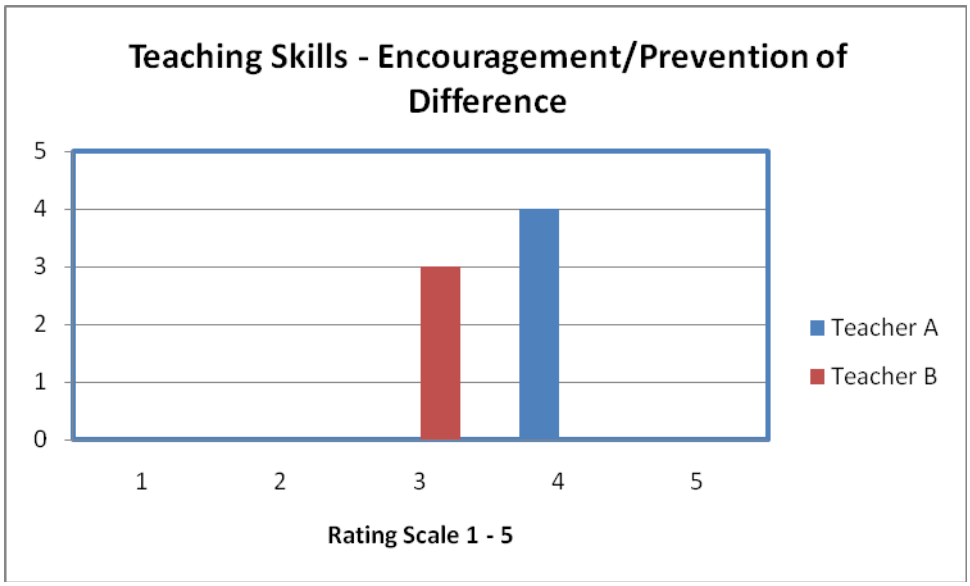

Figure 5.2: Teaching Skills – Encouragement/Prevention of Difference

5.2.4 Responsibility For Own Work

In relation to the children's ability to manage their own work, both teachers allowed the children to encourage more of their own input into their lessons. Within lesson 1 as conducted by Teacher (A), the children were allowed to work independently within a given time frame. The teacher observed the progress of the children and monitored their progress by questioning their reasons for certain actions. Teacher (B) allowed for each child to be responsible for their own answers to the questions which were posed orally and through group work. The results can be observed in figure 5.3.

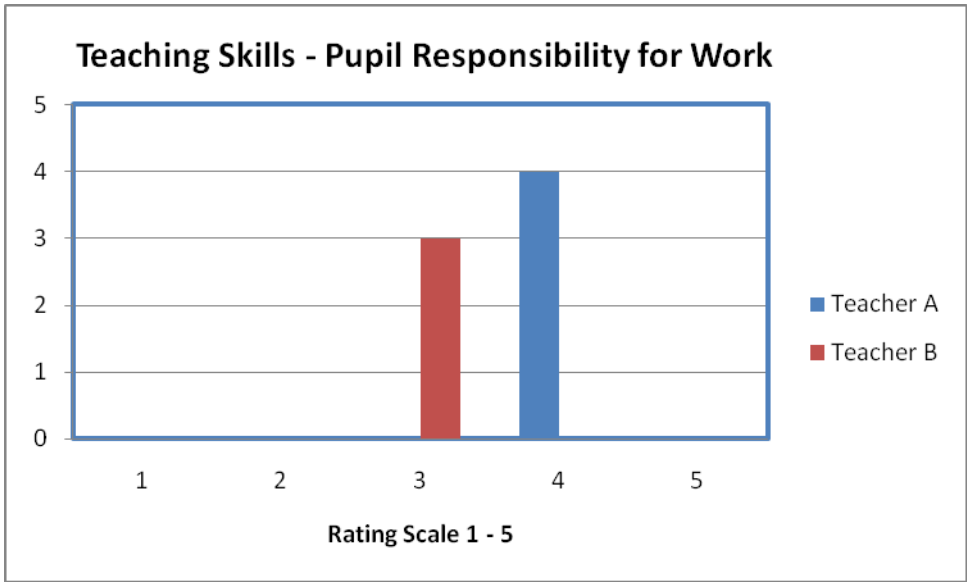

Figure 5.3: Teaching Skills – Pupil Responsibility for Work

There was very little variation between both teachers' SCOTS rating scales regarding authoritarian/democratic practices in terms of lesson selection in figure 5.4. In the literature, Crawford (1999) argued that the relationship between pupils and teachers could be undermined by the movement from teachers as 'god's of knowledge' to directors of learning. In both lessons, the teachers introduced lessons to the class which were pre-determined by both teachers. Cogill (2002) had observed that the use of ICT within the classroom could lead to difficulties which were dependent upon the constructs of the individual teachers. However, in this instance it was difficult to suggest that this was due to the fear of a change in the teacher student relationship or loss of control. As is the case with teaching, a certain amount of planning must take place before a lesson and the children may not have a choice in the selection of the lesson topic.

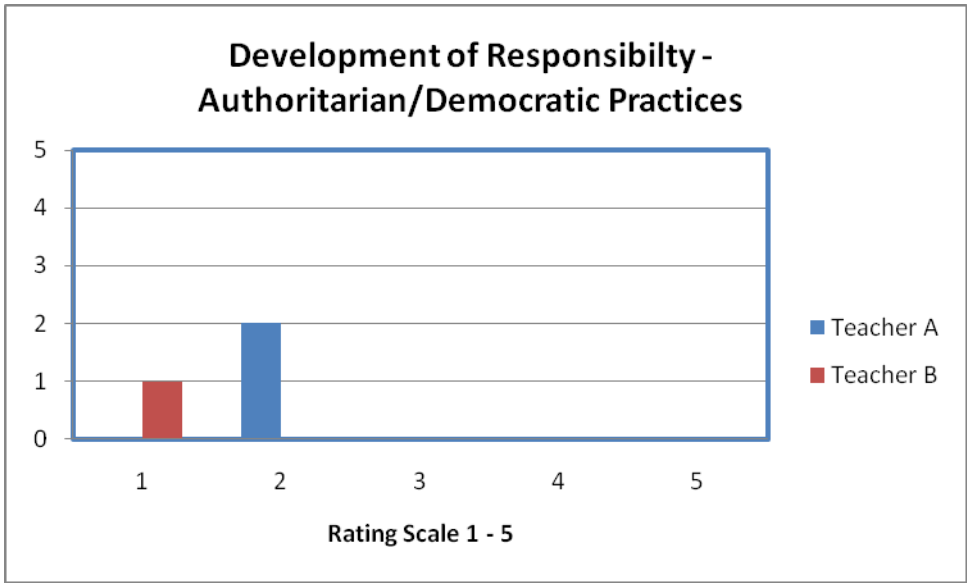

Figure 5.4: Development of Responsibilty – Authoritarian/Democratic Practices

In terms of developing a sense of responsibility, the levels observed between both lessons are highlighted below in figures 5.5, 5.6. and 5.7. In both lessons, the teachers made the best possible efforts to include all children and to allocate duties accordingly to the children. This would have involved accessing resources and the opportunity to for movement within the classroom. At the commencement of both lessons, the teachers adapted a didactic approach.

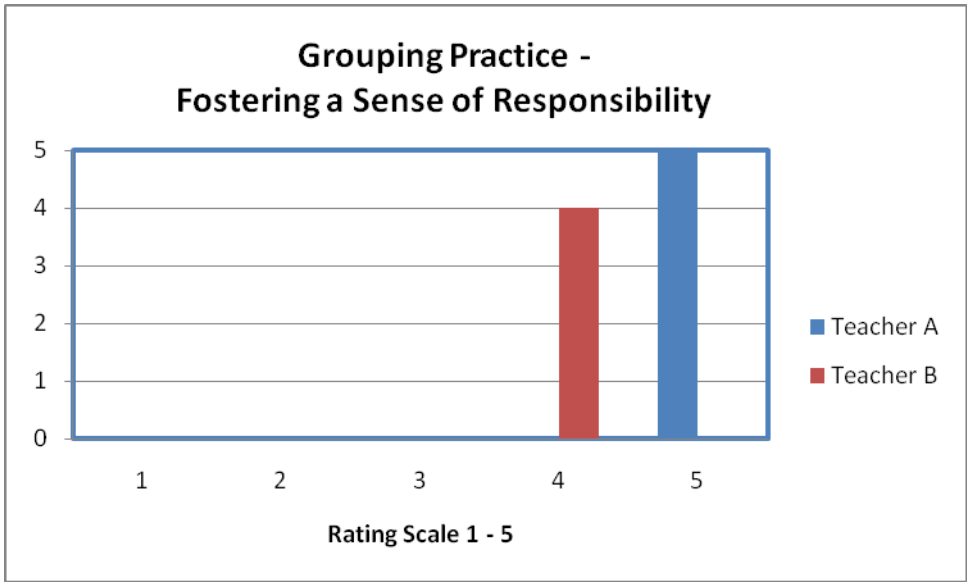

Figure 5.5: Grouping Practice – Fostering a Sense of Responsibility

However, as the lessons progressed the children were allowed to co-operate with other children in response to the lesson. This was particularly evident in lesson 1, whereby the children had the freedom to access human resources, as well as computers and other materials from the classroom.

This type of social constructivist model of classroom interaction developed the views of Wiggins & Ruthmann (2002). In the literature, they had reported that the teacher acted as a mediator between the computer and the learning experience of the children.

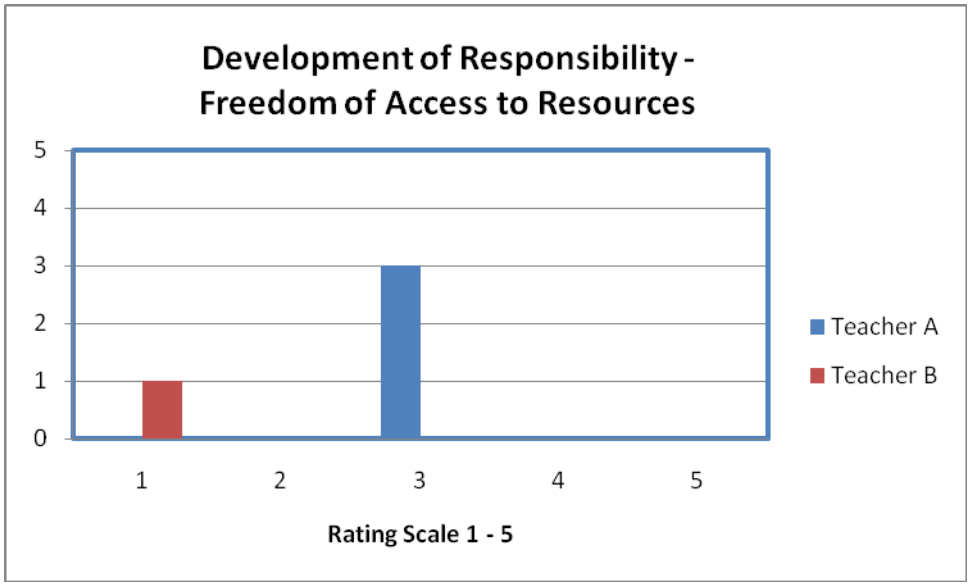

Figure 5.6: Development of Responsibilty – Freedom of Access to Resources

During observation lesson 2, it was noted that the children did not have the requirement for access to non-human resources. Teacher (B) had mentioned in the interviews that quite often the children were previously required to be moved to the top of the class to be seated around the teacher during story time. However, the use of the IWB in these types of lessons allowed for minimal disruption of this type within the classroom. This was in agreement with Levy (2002) who commented that it removed the disruption associated with movement and also improved visibility for the children.

However, this would not suggest that there was a reduction in interactive learning within the classroom. It was important to note that this type of learning could occur when the learner interacts with the teacher or their peers as well as non human resources. It was felt by the author that teacher (B) modified her approach in response to the needs of the learners as it was a shared reading lesson. This belief was supported by Ferl (2005) in the literature.

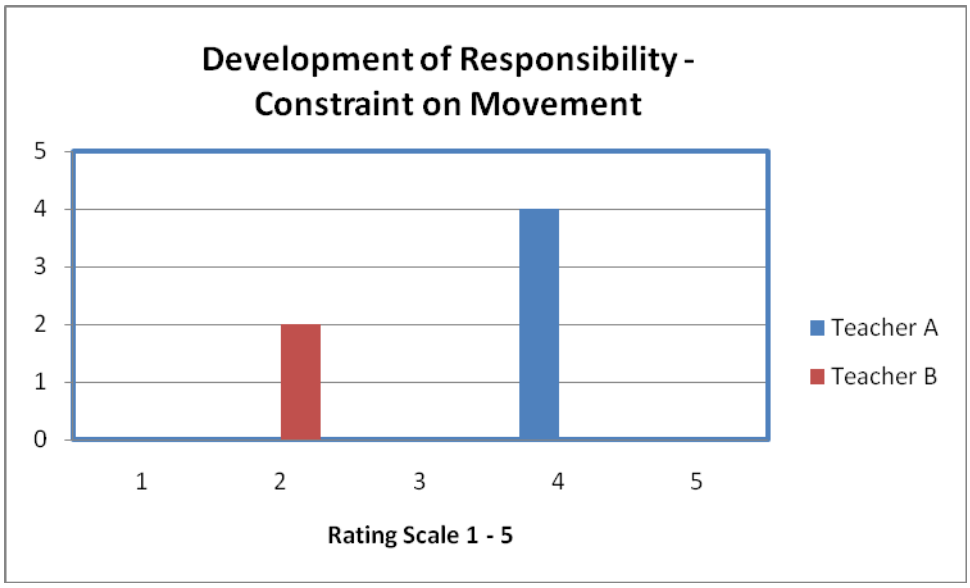

Figure 5.7: Development of Responsibilty – Constraint on Movement

5.2.5 Teaching Instruction

The teachers displayed a high rating on the adapted SCOTS scale when explaining any point in a clear and logical order as can be observed from figures 5.8 and 5.9. In the research literature, Moss et al (2007) identified three themes that centre on the influence of IWBs in changing pedagogy. These were pace, multimodality and interactivity.

From the lesson observations, it was not clear the extent in which all of these aspects of IWB use had influenced pedagogy within the classroom. However, there was a notable reference to graphical representations in both lessons. This was particularly the case when discussing or explaining a point within the lessons. Both lessons had

incorporated a wide variety of muti-modal resources such as picture and sound etc. Kennewell (2004) supported this idea in that a wide variety of multimodal resources facilitates pupil learning. However, the author felt that the same level of instruction could also be achieved with the use of an over head projector, as opposed to an IWB.

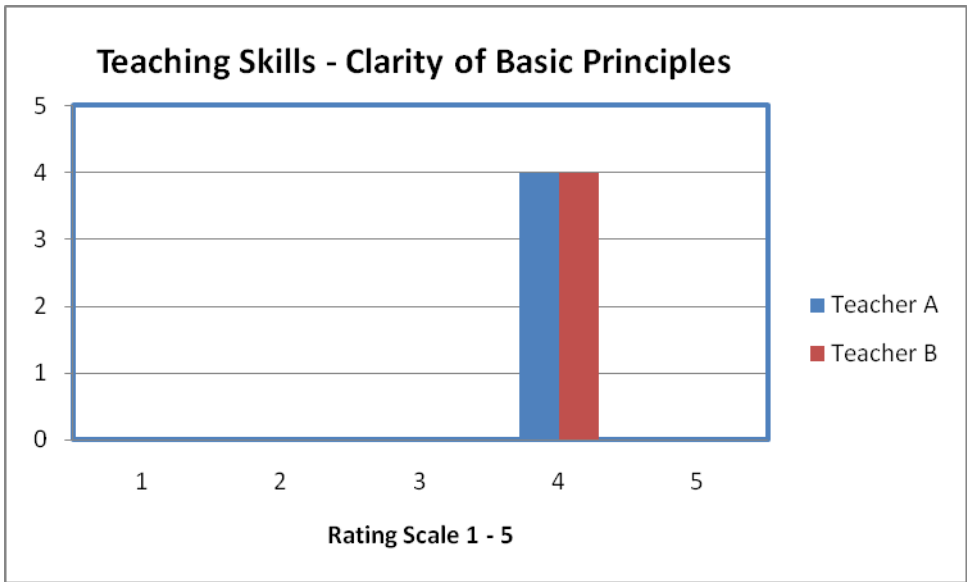

Figure 5.8: Teaching Skills – Clarity of Basic Principles

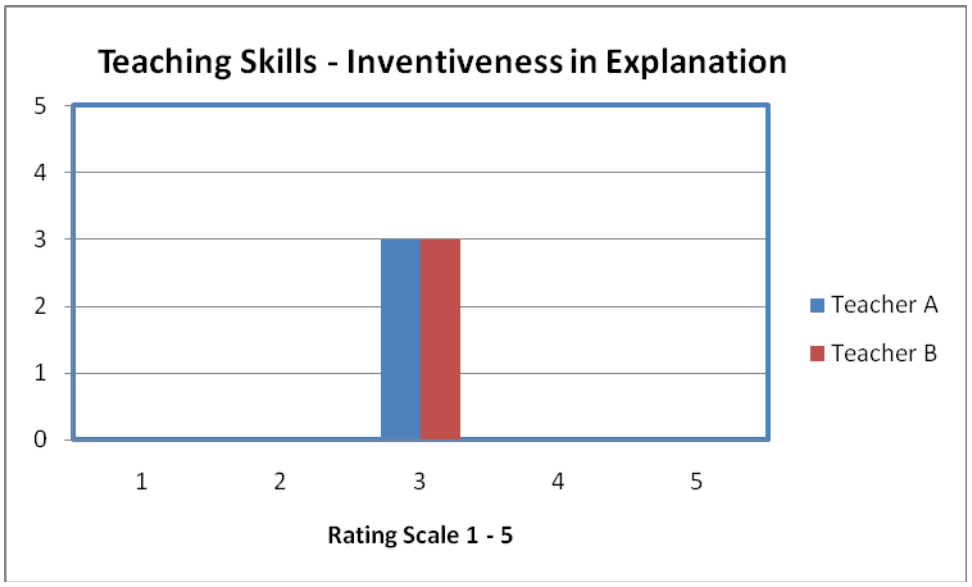

Figure 5.9: Teaching Skills – Inventiveness in Explanation

According to the Revised Curriculum in the literature, teaching is a profession whereby an individual's approaches and enthusiasm must be varied to take into consideration the interests and motivation of children, (DES, 1999)

The teachers' enthusiasm in conducting the lessons regarding the stimulativeness and dullness of teaching could be observed in figure 5.10. Teacher (B)'s lesson generated a good interest from all the children, and a high level of enthusiasm was evident in this instance. Teacher (A) also exhibited a high level of interest and the majority of the class seemed very eager to become involved in the lesson. This would concur with the teacher's comment in the interviews about being motivated in her approach. This was in agreement with Cogill (2002), where in cases where teachers seemed to be motivated by the boards could in turn influence the pupil's perceptions.

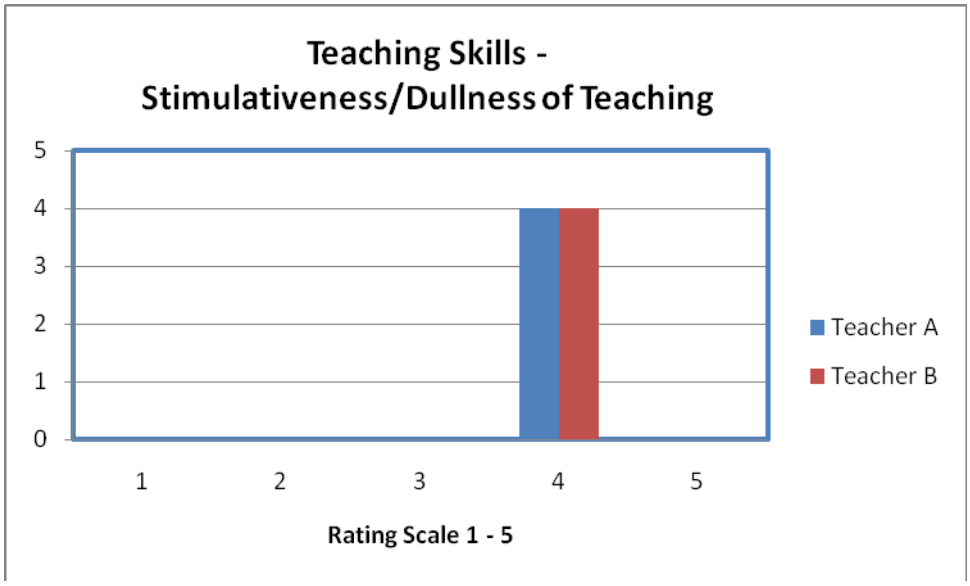

Figure 5.10: Teaching Skills – Stimulativeness/Dullness of Teaching

5.2.6 Teacher's Attitudes towards IWBs and Pedagogic change

The introduction of the IWB into the classroom, had led to positive feedback from both teachers in the case study. Although, the course of study was quite limited, it was felt that the capability of IWBs to complement the concept of 'teaching from the

front', had allowed the teachers to embed the IWB within their existing styles (Gillen et al., 2007). From analysing the findings obtained in both the interviews and classroom observations, it would suggest that both teachers had adapted the IWB within their existing pedagogy. Watson (1983) agreed with this notion in that successful teachers were willing to adopt IT to support their pedagogy. He further commented that this practice was often innovative, where teachers used collaborative work and discussion as an important component of their teaching.

Both Teachers (A) and Teacher (B) had also stated that the introduction of the IWB into their classrooms had generated more freedom in their lessons, but that they had adapted it within their existing pedagogy. This view was in agreement with McCormick and Scrimshaw (2001), where the use of the IWB in the classroom had allowed teachers to teach more efficiently, but that their pedagogy had hardly changed. This was further acknowledged by Greiffenhagen and Levy (2002) in the literature, where the IWB was seen as a new tool, but not a piece of technology that would change their practice. They also highlighted the benefits the IWB brought to education, although Teacher (B) commented that there were also other approaches which were important.

5.2.7 Pedagogy and Levels of Interactivity

From further examination, there was ample evidence to suggest that active learning was taking place in the classrooms of both teachers. Brown (2004) supported this view of active learning that the use of an IWB in the classroom would increase the levels of interactivity. Both teachers had mentioned about the incorporating of interactive approaches to their teaching. It was important to note that although the teachers in the case study adopted the same initial whole class approaches with the technology.

However, as the lessons progressed, there were differing levels of interactivity displayed between both lessons. This was a consequence of the age profile of the children and the aim of the lesson. Within the course of both lessons, the attitudes of

both teachers tended to favour a level of interactivity which was not technical or physical but what is known as conceptual. This is where there is a focus on interacting with and exploring curriculum concepts and ideas, (Jewitt et al., 2007).

This raises the question regarding interactivity and its components. As stated previously, interactivity could be displayed in different ways. Some reports in the literature had suggested that this 'idea of conceptual or pedagogic interactivity could be linked with pupil participation in whole-class operations as opposed to other forms of interactions', (Becta, 2003, [Online]). Higgins et al (2007) further approved of this, where they stated that good teaching remained good teaching with or without the use of technology.

5.3 Professional Development

5.3.1 Teacher Professionalism

Mc Culloch et al., (2000), suggested that improvements in education depended on the teacher wanting to make a difference. Teacher (A) had commented that it was important as Principal to be seen to encourage and develop people's skills, with the needs of the children in mind. The principal's role as a

> leader of the school community and as a leading professional with extensive classroom experience is pivotal in guiding staff and pupils towards reaching their full potential. The role of the leader is to have a clear vision shared by colleagues and to see the school, not only as it is, but as it can become, (*Report of the Working Group on the Role of the Primary School Principal*, Department of Education and Science, 1999, p.30).

Mc Culloch et al. (2000), further stated that in order for this to be achieved, it largely depended on the individuals feelings of professionalism and that teachers had to want improvement, in order for it to happen. This would concur with the views of Teacher (B) who mentioned that it depended on the person's own views, but that some people were maybe happy with their own levels of ability.

5.3.2 Teacher Professional Development

In terms of teacher professional development both teachers views of professionalism varied to a certain extent. As stated previously, there were very few precise definitions of the term professional development in the research literature. The view of Teacher (A), whereby the catalyst for professional development was centred on the needs of children, could be seen to closely concur with the views expressed by Day (1999). He proposed that the process by which teachers review and act as change agents is largely influenced by the moral purposes of teaching. Teacher (A)'s moral purpose of teaching was to keep the needs of the children in mind.

The need to develop skills in a certain area and the tendency to develop skills was largely dependent upon being comfortable with their level of ability, according to Teacher (B). However, it was also felt that a number of underlying factors may influence the extent of one's professional development.

5.3.3 Teacher Professional Change

It was noted in the research literature that teaching had undergone major changes in the last decade. This was expressed by both teachers who had commented that the revised curriculum had placed extra teaching demands on them. This supported the views of Day, Helsby and Estrela (1999) who mentioned that the teaching profession had experienced changes within the areas of bureaucracy, accountability and managerialism.

In the literature, Helsby (1999) mentioned that the ways in which teachers respond to change can vary to a great extent. She further suggested that a teacher's decision about their pedagogy is centred upon their professional beliefs and their levels of confidence. In order for the IWB implementation to lead to pedagogic change, some considerations were proposed by Helsby (1999).

- The culture in which the technology is introduced

- The beliefs and confidence of individual teachers as they implement change
- The support of management in any implementation

These were subsequently examined in the context of the research findings.

5.3.4 The Culture in which the Technology is introduced

Within the research school, there seemed to be a culture of promotion and development of the children's needs. Both teachers had mentioned that the school had made valuable steps in the last few years in introducing the IWBs into the classroom, whereby the main emphasis seemed to be the focus on the best ways to carry out teaching for the children's benefit.

In this instance, Teacher (A) had mentioned about the ways in which she tried to focus on the development of skills within her teaching. This would support the views of Sheppard (2003), who commented that Principal teachers are considered to be leaders of curriculum innovation. She had commented that the application for Digital School's Status was an incentive for them to use the equipment more productively and to encourage staff to use it more effectively. Consequently, this would allow them to question their current attitudes and beliefs in relation to their pedagogy, which is supported by Lai (1999).

5.3.5 Beliefs & Confidence of individual teachers as they implement change

The use of IWBs in the classroom could be seen to have an impact on the ways in which teaching was taking place in the school. According to NCCA (2004), the introduction of ICT allows children to engage in greater opportunities in active learning than traditional teaching pedagogies. This could be considered to be the case in the lessons observed and also in the interviews. However, there was no other information that could suggest that this was taking place on an on-going basis. Although, confidence and experience levels among some of the teachers was quite

good, it was not clear whether the IWB had brought about pedagogic change within the research school.

According to Richardson & Placer (2001), some people do not change despite the alterations taking place in the setting in which they work. It seems from the interviews that both teachers had always encouraged an active teaching pedagogy, although teacher (B) had mentioned that some people may be comfortable with their ability and may not feel the need to change. However, this is something which may evolve slowly over time, as Stephens et al., (1983) had suggested that teacher change is a lifelong process of professional growth.

5.3.6 The Support of Management in any Implementation

From analysis of the interviews, both teachers commented on the positive support that they had received from the BOM. They had expressed recognition of the board's role in relation to the encouragement of courses and installation of the IWBs in the classroom. This would support the views of the INTO where 'improvements in the area of professional development, needs to be developed and supported by the Board of Management at school level', (INTO, 2009, [Online]).

5.4 Challenges of IWB use within Pedagogy

5.4.1 Planning & Time Management

Both Teachers (A) and (B) had indicated that the use of the IWB had led them to plan more effectively than they would have previously. Glover et al., (2007) concur with these views, where they stated that the technology requires individuals to plan with greater precision than in traditional teaching approaches. Teachers (A) and (B) in the interviews mentioned that although they used the IWB, it was only used throughout part of their teaching day. The reason for this was that a lot of planning and organising would need to be conducted to use it in each area. Planning and preparation by teachers was considered to be the main feature in changing pedagogy, according to Miller et al., (2005).

Hall and Higgins (2005) suggested that interactive pedagogies which were created with an IWB could be reduced due to the pressure to cover the content of the curriculum, particularly in the secondary school context. However, in this situation, both teachers felt that the revised primary curriculum of 1999 had created additional demands on them as teachers, in a timetable which they felt was already congested. Both felt this was the case particularly within the multiclass context.

5.4.2 Training & Curricular Support

An important theme to emerge from the findings was the issue of training in the use of the IWB. In the literature, Harris (2002), stated that the introduction of a new technology into a classroom would require staff to be trained both technically and to change their existing pedagogy. Although, the major concern expressed with both teachers was the lack of formal training and curricular support provided with the introduction of the IWB. Malavet (1998) and Greiffenhagen (2002), suggested when a teacher tries to use an IWB as a transformative pedagogic tool, a lack of methodological and practical training can impede and frustrate their aims. However, this did not seem to be the case in the research school. Both teachers expressed difficulties they had encountered in the early days. However, this was resolved by a trial and error process and the undertaking of courses in some instances.

5.4.3 Attitude Development

From analysis of the interviews and classroom lesson observations, it became apparent that individuals who felt that there were advantages to be obtained from using the IWBs, sought help from the BOM in obtaining the technology. It was clear from Teacher (A) that the need to develop different ways to teach was the defining factor than other influences in terms of incorporating the IWB within her teaching.

Teachers who were confident in the use of ICT, tended to become enthusiastic ‘early adopters’ and experimented with their use of the IWB, according to a study conducted by Levy, (2002). In contrast to this, Granger et al (2002), commented that

those who were less able to be self-reliant were those with less experience and confidence in the area of ICT.

As previously mentioned, both teachers experimented with the tool upon its introduction in the classroom. It was interesting to note that in this research study, Teacher (B) who was the youngest and with the most experience in the area of ICT, did not seem to be as enthusiastic about ICT as one might have expected. However, it was difficult to interpret whether this was due to personal or professional reasons. This would be in contrast to the views of Sheppard (2003), where he stated that the younger teachers tend to be more knowledgeable and are more confident with technology than the more experienced teachers.

5.5 Conclusion

From the research, it can be observed that both teachers had integrated the IWB within their existing pedagogy. Both commenced with a didactic approach to their pedagogy which slowly moved towards an interactive approach. This interactive approach led the children to work collaboratively and there was less emphasis on the interaction with the board. This allowed them to engage in more active learning than some traditional pedagogies. In the literature, Helsby (1999) proposed that IWB implementation could give rise to pedagogic change. This was examined in the discussions, but it was felt that there were a number of factors which challenged IWBs and pedagogic change.

Chapter 6 – Conclusion

6.1 Introduction

It can be observed from the research case study, that the teachers in this study were making successful attempts at integrating IWBs within their daily teaching. Both teachers had mentioned that they had adapted the IWB within their existing pedagogy. It would also appear that the teachers existing pedagogical approaches and thinking appeared to shape the IWB use. It was noted that the depth of pedagogical interactivity varied between and within both lessons. This was a consequence of the age profile of the children and the pedagogic aims of the lessons. Also, it was felt that the potential of IWB use in terms of its pedagogical interactivity was not fully exploited. This was largely attributed to a number of factors which can be observed in the subsequent sections.

6.2 Summary of Findings

6.2.1 Professional Development and Pedagogy

The profession of teaching in general had undergone major changes within the last decade. It was felt by both teachers in the study, that additional teaching demands had been placed on them as a consequence of the revised curriculum. This in turn was considered to have influenced their daily teaching within the classroom.

Within the study, both teachers believed that professional development was important within the profession, but their reasoning for development varied to a certain degree. This ranged from expectations due to their position held within the school, to being comfortable with existing levels of ability.

It was also found that teachers in the study responded to change in different ways and this was supported in the literature by Helsby (1999). If the introduction of the IWB was to give rise to a change in pedagogy, the following factors were important.

- **The Culture in which technology was introduced**

It was observed that a positive culture existed within the research school. The school had applied for Digital School's Status to use the equipment more productively and this had the intention of encouraging the staff members to examine their existing attitudes towards their pedagogy.

- **Beliefs and Confidence of teachers as they implement change**

The use of the IWBs within the classroom had not altogether impacted the way in which teaching was taking place in the school. Both teachers were reasonable level of competency in the use of the IWBs, although the extent to which it had changed their pedagogy was not evident.

- **The support of the Management in any implementation**

The BOM within the school had encouraged both members of staff to take part in professional development at every opportunity. The teachers were also supportive of the steps that the BOM had taken within the school.

6.2.2 Challenges of IWB use within Pedagogy

It was found in the case study, that a number of obstacles were evident in the effective use of the IWBs in the classroom.

- **Planning and Time Management**

It was felt by both teachers that the inclusion of the IWB within their pedagogy had led to a greater need for planning in their lessons. The revised curriculum had led to greater teaching demands particularly in the multi-class situation.

- **Training and Curricular Support**

A major concern expressed by the teachers was that there was inadequate curricular training received with the introduction of the IWBs. This was improved but not

resolved, through a combination of discovery learning and professional development.

- **Attitude Development**

The attitude of the teachers in the study was very professional towards IWB use, although there was a varying degree of experience in ICT between both teachers. It was interesting to observe that one of the teachers with the most experience was not as enthusiastic about the benefits of the resource. However, both teachers did try to incorporate the IWB within their classroom as a teaching tool.

6.3 Issues emerging from the Research

From analysing the case study, it could be seen that the extent of IWB use within this classroom had not given rise to radical pedagogic change. It could be observed through the interviews and classroom observations, that the IWB was being used as a tool within their existing pedagogy in the classroom.

Within the lessons, there was a sense of conceptual interactivity being created whereby the introduction of the IWB could be used interactively throughout whole-class teaching. The children were allowed to express their ideas verbally, but also through other representations e.g. group/pair work. From the interviews, it was found that this type of active learning environment had always existed prior to the integration of the IWB in the classroom.

An important issue regarding the findings relates to the notion of classroom interactivity. There is a general belief that the IWB has the capacity to develop pedagogical approaches by encouraging greater interactivity within the classroom. However, this is dependent upon a number of factors. Latane (2002) suggested that interactivity needs to be pupil-pupil as well as pupil-teacher based and this may require changes in classroom practice. It is also important to be aware of the views of Smith et al. (2006), who commented that less interactive use of the technology may increase the interaction between the teacher and pupils or between pupils.

In the research it can be seen that both teachers are using the IWB within their pedagogy to promote interactivity within the context of dialogue, discussion etc. However, it seems that the IWB is being used as none other than a modern day version of a traditional blackboard. The main issue here is that if the teachers are using the IWB within their existing pedagogy, then how can they maximise the board's full capabilities to further enhance their pedagogy?

It could be seen that the full extent of what is achievable with the IWBs was not being maximised. It was felt that the revised curriculum had led to an increase in planning and time management. However, could changes in the process of training, curricular support, together with professional attitudes allow the potential of the IWB to transform their pedagogy completely? As a consequence, this in turn may lead to an improvement in the overall development of teaching approaches within the classroom.

6.4 Conclusions

Guskey (1986) in the literature had spoken about change being a difficult and a gradual process. In order for change to occur, teachers would need to be given considerable encouragement and support. The case study had highlighted difficulties with planning and time management in terms of using the IWBs more effectively. This could also be linked to the difficulties of training and curricular support and professional development.

6.4.1 Restructuring of Training

In order for solutions to occur, the whole concept of training would initially need to be restructured. If one is to examine the concept of training in relation to the use of IWBs that schools receive, there is quite a distinction between technical and pedagogic training. The concept of IWB technical training involves and outlines how to use and operate the technology, whereas pedagogic training examines how to integrate it within the context of the curriculum.

However, a more holistic approach to pedagogic training would be to more closely link it to a more subject specific approach, (Jewitt et al., 2007). This would be of great benefit for the teaching and learning process in the classroom. Both teachers in the study had felt that this was something they had difficulty achieving.

6.4.2 Professional Development and the Curriculum

Within a policy level, professional development opportunities need to be linked within the curriculum. The changing nature of technology which is evolving at a rapid rate, gives rise to the concept of ICT professional development being considered inadequate in a very short period of time. As a consequence, the provision of workshops or in-service days can not be considered to be a long term benefit, (Jewitt et al., 2007).

It may be important for educational policy makers within this country, to examine the role of other countries within the EU who have taken steps in the right direction. It was found that in Denmark, the pedagogical computer driving licence focuses on the use of ICT to support innovative teaching strategies in the curriculum, (NCCA, 2004).

There is also the need for the government to provide the time and opportunity to practice and experiment with IWBs in order to lead to a more transformative pedagogical change. It would also be important to examine Guskey's (1986) model of effective staff development in the literature. An important consideration is the need for teachers to receive time and space as well as the opportunity to experiment with the new ideas. This would allow them time to reflect on their experiences as well.

6.5 Concluding Comment

As the study had suggested the IWBs as a catalyst for pedagogic change was influenced by a number of factors. These have ranged from integrating the IWB into existing pedagogy, to other factors within the educational system. The need for a greater process of pedagogical development through policy and personal aims is also very important.

The revised curriculum states that the teacher needs to adopt innovative approaches to teaching. However, there is a need for a clearer understanding of the technology and an improved confidence in the pedagogical approaches, in order for the teacher to promote a more transformative pedagogy. However, it is only when there is a harmony between these components, will teachers feel more comfortable in transforming classroom practice, (Rudd, 2007).

Bibliography

Andrews, P. (1999), 'Some institutional influences on secondary mathematics teachers' use of technology'. *Education and Computing*, 14 (2) 113-128.

Anseo (2009), *'Anseo'*, [Online].

Available: http://www.anseo.net [Accessed 28th January 2009]

Ball, B. (2003), 'Teaching and Learning mathematics with an interactive whiteboard'. *Micromath*, 19 (1), 4-7.

Banks, F.R.J. (1996), 'Developing professional knowledge during initial design and technology teacher education'. *The Journal of Design and Technology Education*, 1 (2) 175-178.

Beauchamp, G. and Parkinson, J. (2005), 'Beyond the "wow" factor: developing interactivity with the interactive whiteboard'. *School Science Review*, 86 (316) 97–103.

Becta, (2003), '*What the research says about interactive whiteboards'*. [Online].

Available: http://www.becta.org.uk/research. [Accessed 14th March 2009]

Becta (2004), *Getting the most from your interactive whiteboard: a guide for Secondary schools*, Coventry, Becta.

Becta (2007), *' The DCSF Primary Schools Whiteboard Expansion Project'*. [Online]. Available:

http://partners.becta.org.uk/index.php?section=rh&catcode=_re_rp_02&rid=14422

[Accessed 14th November 2008]

Beeland, W.D. (2002), 'Student engagement, visual learning and technology: can interactive whiteboards help?'. *Action Research Exchange*, 1 (1) 20-42.

Blatchford, I., S., Sylva, K., Muttock, S., Gilden, R., Bell, D., (2002) '*Researching Effective Pedagogy in the Early years'*. [Online].

Available: http://www.dcsf.gov.uk/research/data/uploadfiles/RR356.pdf

[Accessed 21st January 2009]

Brown, S. (2004), '*Interactive whiteboards in Education'*. [Online].

Available:
http://www.jisc.ac.uk/uploaded_documents/Interactivewhiteboards.pdf

[Accessed 16th February 2009]

Campbell, D.T. and Fiske, D.W. (1959), 'Convergent and discriminant validation by the multitrait-multtimethod matrix'. *Psychological Bulletin*, 56 (1) 81-105.

Carlson, S.L. and White, S.H. (1998), 'The effectiveness of a computer program in helping Kindergarten students learn concepts of left and right'. *Journal of Computing in Childhood Education*, 9 (2) 133-147.

Carr, L. (1999), 'Bringing Lessons to life', *Managing Schools Today*, 9 (1) 14.

Cavan, S. (1977), 'Investigative Social Review: Individual and Team Field Research'. *The American Journal of Sociology*, 83 (3) 809-11.

Cicourel, A.V. (1964) *Method and Measurement in Sociology.*
New York: The Free Press.

Clemens, A., Moore, T. & Nelson, B. (2001), '*Math intervention 'SMART' project'*. [Online].

Available: http://www.smarterkids.org/research/paper10.asp

[Accessed 19th February 2009]

Cogill J. (2002), '*The use of interactive whiteboards in the primary classroom: what is effective practice and how does this relate to effective practice in teaching with ICT ?'*. [Online].

Available: http://www.becta.org.uk/research/research.cfm?section=1&id=2854.

[Accessed 26th May 2009]

Cogill, J. (2003), *The use of interactive whiteboards in the primary school: effects on pedagogy*. Coventry, Becta.

Cohen, J.J. (2006) 'Professionalism in medical education, an American perspective: from evidence to accountability'. *Medical education*, 40 (7) 607-617.

Cohen et al. (2004), *Research Methods in Education*, Fifth Edition,
Routledge-Falmer.

Crawford, R. (1999), 'Teaching and learning IT in secondary schools: Towards a new pedagogy?'. *Education and Information Technologies*, 4 (2) 49-63.

Darling-Hammond, L. (1994), *Developing professional development schools: early lessons, challenge, and promise,* New York, Teachers College Press.

Dawes, L. (2000), 'First Connections: Teachers and the National Grid for Learning'. *Computers and Education,* 33 (4) 235-252.

Day, C. (1999), *Developing teachers. The challenges of lifelong learning*. London, Falmer Press.

Derek, G., David, M., Doug, A. and Victoria, D. (2005) 'The Interactive Whiteboard: a Literature Survey', *Technology, Pedagogy & Education*, 14 (2) 155-170.

DES (Department of Education and Science), (1999), *Primary School Curriculum*, Dublin, Stationery Office.

DES (Department of Education and Science), (1999), *Report of the Working Group on the Role of the Primary School Principal*, Dublin, Stationery Office.

DES (Department of Education and Science), (2008), *Investing Effectively in Information and Communications Technology in Schools, 2008-2013*, Dublin, Stationery Office.

Dictat (2009), **'***Dictat Archives'*. [Online].

Available: http://groups.yahoo.com/group/dictat/messages

[Accessed 20th November 2008]

Digital Schools (2009), *'Digital Schools'*. [Online].

Available: http://www.digitalsschools.ie

[Accessed 20th November 2008]

Ebbutt, D. (1985), *Educational action research: some general concerns and specific quibbles. In R.G. Burgess (ed.) (1985b) Issues in Educational Research: Qualitative Methods.* Lewes, Falmer.

Eraut, M. (1991), *Education and the Information Society*. London, Casell Educational.

Evans, L. (2007) 'Professionalism, Professionality and the Development of Education Professionals', *British Journal of Educational Studies*, 56 (1) 20-38.

Ferl (2005), '*What is interactive teaching and learning?'*. [Online].

Available: http://ferl.qia.org.uk/display.cfm?page=865

[Accessed 23rd November 2008]

Finnegan, R. (1996), Using documents. In R. Sapsford and V. Jupp (1996) (eds) *Data Collection and Analysis*. London, Sage Publications & the Open University Press.

Flores, M. (2005), 'Teachers' views on recent curriculum changes: tensions and challenges'. *The Curriculum Journal*, 16 (3) 401-413.

Fullan, M. (1993), *Change forces. Probing the depths of educational reform.* London, The Falmer Press.

Gillen, J., Staarman, J.K., Littleton, K., Mercer, N., & Twiner, A. (2007) 'A 'learning revolution'? Investigating pedagogic practice around interactive whiteboards in British primary classrooms'. *Learning, Media, & Technology*, 32 (3) 243-256.

Glover, D., & Miller, D. (2001), 'Running with technology: the pedagogic impact of the large-scale introduction of interactive whiteboards in one secondary school', *Journal of Information Technology for Teacher Education*, 10 (3) 257-277.

Glover, D. & Miller, D. (2002b), 'The introduction of interactive whiteboards into schools in the UK: Leaders, led and the management of pedagogical change', *International electronic journal for leadership in learning*, 6 (24) 112-128.

Glover, D. & Miller, D. (2004a), *'Matching technology and pedagogy in teaching mathematics: understanding fractions using a 'virtual manipulative' fraction wall'*, [Online]

Available: http://www.keele.ac.uk/depts/ed/iaw/docs/BERA%20Paper%20Sep%202004.pdf

[Accessed 18th December 2008]

Glover, D., Miller, D., Averis, D., Door, V. and Glover, D. (2007), 'The evolution of an effective pedagogy for teachers using the interactive whiteboard in mathematics and modern languages: an empirical analysis from the secondary sector'. *Learning, Media, & Technology*, 32 (1) 5-20.

Gokhale, A.A., (1995), 'Collaborative learning enhances critical thinking'. *Journal of Technology Education*, 7 (1) 112-137.

Granger C.A., Morbey M.L., Lotherington H., Owston R.D. & Wideman H.H. (2002), 'Factors contributing to teachers' successful implementation of IT', *Journal of Computer Assisted Learning*, 18 (3) 480-488.

Greiffenhagen, C. (2002), *'Out of the office into the school: electronic whiteboards for education'*. [Online].

Available:
http://web.comlab.ox.ac.uk/oucl/work/christian.greiffenhagen/pub/boards/.

[Accessed 17th May 2009]

Gusky, T.R. (1986), 'Staff Development and the process of change', *Educational Researcher*, 15 (5) 5-12.

Hall, I. and Higgins, S.1. (2005), 'Primary school students' perceptions of Interactive Whiteboards', *Journal of Computer Assisted Learning*, 21 (2) 102-17.

Handy, C. and Aitken, R. (1986), *Understanding Schools as Organisations*. London, Pelican Books.

Hargreaves, A., & Fullan, M.G. (1992), *Understanding Teacher Development*. New York, Teachers College Press.

Hargreaves, A. (1994), *Changing teachers, changing times: teachers' work and culture in the postmodern age*. New York, Teachers College Press.

Hargreaves, L., Moyles, J., Merry, R., Patterson, F., Pell, A. and Esarte-Sarries, V. (2003), 'How do primary school teachers define & implement 'interactive teaching' in the National Literacy Strategy in England?'. *Research Papers in Education*, 18 (2) 217-236.

Harris, S. (2002), 'Innovative pedagogical practices using ICT in schools in England', *Journal of Computer Assisted Learning*, 18 (1) 449-458.

Helsby, G. (1999), *Multiple truths and contested realities. The changing faces of teacher professionalism in England. The life and work of teachers. International perspectives in changing times*. London, Falmer Press.

Hennessy, S., Deaney, R. and Ruthven, K. (2005), *Developing pedagogical expertise for integrating use of the interactive whiteboard in secondary science*, Glamorgan, British Educational Research Association.

Higgins, S., Falzon, C., Hall, I., Moseley, D., Smith, F., Smith, H. and Wall, K. (2005), *Embedding ICT in the Literacy and Numeracy Strategies: Final Report*, Newcastle: University of Newcastle School of Education, Centre for Learning and Teaching.

Higgins,S, Beauchamp, G and Miller, D (2007), 'Reviewing the literature on Interactive Whiteboards'. *Learning, Media and Technology*, 32 (3) 213-35.

Hinostroza, E. Mellar, H. (2000), 'Teacher's beliefs about computers: report of a case study'. *Journal of Educational Computing Research*, 22 (4) 397-409.

Hooper, S., & Rieber, L., (1995), *'Teaching with technology'*, [Online].

Available: http://www.nowhereroad.com/twt

[Accessed 9th April 2009]

Hopkins, D. (1985), *A Teacher's Guide to Classroom Research*. Milton Keynes, Open University Press.

Hughes, M. & Longman, D. (2005), '*Interactive Digital Display Boards and class teaching: interactive or just another epidiascope?'. Paper presented at the 2005 British Educational Research Association Conference*, September 2005, Glamorgan.

INTO, (2009), *'INTO'*, [Online].

Available: http://www.into.ie/ROI/WhatsNew/NewsBriefs/INTOSubmissions/filedownload,5576,en.pdf

[Accessed 16th January 2009]

Inver (2009), 'Inver', [Online].

Available: http://www.iol.ie/~bmullets/

[Accessed 21st November 2008]

Jewitt, C. (2007), *Technology, literacy and learning: a multimodal approach.* London, Routledge-Falmer.

Jones, A., & Compton, V. (1998), 'Towards a model for teacher development in technology education: From research to practice'. *International Journal of Technology and Design Education*, 8 (1) 51-65.

Joyce, B., & Showers, B., (1988), *Student achievement through staff development.* New York, Longman.

Kemmis, S. & McTaggart, R. (1992), *The Action Research Planner,* Second Edition. Geelong, Victoria, Australia: Deakin University Press.

Kennewell, S. & Beauchamp, G. (2003), 'The influence of a technology-rich classroom environment on elementary teachers' pedagogy and children's learning'. In Wright, J., McDougall, A., Murnane, J.*et al.* (Eds.) *Young children and learning technologies*, Sydney: Australian Computer Society.

Kennewell, S. (2004), '*Researching the influence of interactive presentation tools on teacher pedagogy'*. *Paper presented at the British Educational Research Association Conference*, September, 2004, UMIST,:Manchester.

Kennewell, S. & Beauchamp, G. (2007), 'The features of Interactive Whiteboards and their influence on learning'. *Learning, Media, & Technology*, 32 (3) 227-241.

Kerlinger, F.N. (1970), *Foundations of Behavioural Research*. New York, Holt, Rinehart & Winston.

Knight, P., Pennant, J. & Piggot, J. (2004), 'What does it mean to use the interactive whiteboard in the daily mathematics lesson?'. *Micromath*, 20 (2) 14-16.

Kvale, S. (1996), *Interviews.* London, Sage Publications.

Lai, K. W. (1999), *Net-Working: Teaching, Learning & Professional Development with the Internet*. University of Dunedin NZ, Otago Press.

Lee, R.M. (1993), *Doing Research on Sensitive Topics*. London, Sage Publications.

Levy, P. (2002), '*Interactive whiteboards in learning and teaching in two Sheffield schools: a developmental study'*. Department of Information Studies, University of Sheffield, England. [Online].

Available: http://www.shef.ac.uk/eirg/projects/wboards.

[Accessed 4th January 2009]

Lewin, C., Mavers, D. and Somekh, B. (2003), 'Broadening access to the curriculum through using technology to link home and school: A critical analysis of reforms intended to improve students' educational attainment', *The Curriculum Journal*, 14 23–53.

Lincoln, Y.S. and Guba, E.G. (1985), *Naturalistic Inquiry*. Beverly Hills, Sage Publications.

Malavet, P.A. (1998), *'Interactive Whiteboards: the technology of the future, working with traditional pedagogical methodology'*. [Online].

Available: http://nersp.nerdc.ufl.edu/~malavet/

[Accessed 26th January 2009]

Mc Cormick, R. and Scrimshaw, P. (2001), 'Informations and Communications Teachnology, Knowledge and Pedagogy', *Education, Communication and Information*, 1 (1) 37-57.

Mc Culloch, G., Helsby, G. & Knight, P. (2000), *The politics of professionalism. Teachers and the curriculum*, London, Continuum.

Miller, D.J. Averis, D. Door, D. & Glover D. (2005), '*How can the use of an interactive whiteboard enhance the nature of teaching and learning in secondary mathematics and modern foreign languages?'*, [Online].

Available: http://www.becta.org.uk/page_documents/research/bursaries05/interactive_whiteboard.pdf

[Accessed 27th March 2009]

Mc Niff, J. (2001), '*Action Research and the Professional Learning of Teachers'*, [Online].

Available: http://www.jeanmcniff.com/writings.html

[Accessed 7th June 2009]

Miller, D. (2003), 'Developing interactive whiteboard activity', *MicroMath*, 19 (2) 33-35.

Miller, D. and Glover, D. (2004b), 'Players in the management of change: Introducing interactive whiteboards into schools', *MIE*, 17 (1) 20–23.

Morrison, K.R.B. (2003), *Planning and Accomplishing School-centred Evaluation*. Norfolk, Peter Francis Publishers.

Moseley, D., Higgins, S. and Bramald, R. (1999), *Ways forward with ICT: Effective pedagogy using information and communications technology in literacy and numeracy in primary schools*. Newcastle Upon Tyne, Newcastle University.

Moss, G., Jewitt, C., Levacic, R., Armstrong, V., Cardini, A., & Castle, F. (2007), *'The Interactive Whiteboards, Pedagogy and Pupil Performance Evaluation'*, [Online].

Available: http://www.dcsf.gov.uk/research/data/uploadfiles/RR816.pdf

[Accessed 17th February 2009]

NCCA (National Council for Curriculum & Assessment), (2004), '*Curriculum Assessment and ICT in the Irish context'*. *A Discussion paper*, December 2004, Dublin.

Nisbet, J. & Watt, J. (1984), Case Study. In J. Bell, T. Bush, A. Fox, J. Goodey & S. Goulding (eds) *Conducting Small-scale Investigations in Educational Management*. London, Harper & Row.

Noffke, S.E. and Zeichner, K.M. (1987), *'Action research and teacher thinking'. Paper presented at the annual meeting of the American Educational Research Association*, November 1987, Washington, DC.

OFSTED (2002), *ICT in schools: Effect of government initiatives*. London, Office for standards in Education.

Oppenheim, A.N. (1992), *Questionnaire Design, Interviewing and Attitude Measurement.* London, Pinter Publishers Ltd.

Patton, M.Q. (1990), *Qualitative Evaluation and Research Methods,* Second Edition. London, Sage Publications.

Pearson, M., Haldane, M. and Somekh, B. (2004), *St Thomas of Aquin's Interactive Whiteboard pilot*, Manchester: Manchester Metropolitan University. Scottish Executive.

Platt, J. (1981), 'Evidence and proof in documentary research: some specific problems of documentary research'. *Sociological Review*, 29 (1) 31-52.

Powell, J. (1977), '*Objectivity, Subjectivity and Value judgements in the Context of Classroom Observation of Teaching Styles'. Paper presented at the annual meeting of the American Educational Research Association,* New Orleans.

Rennie, L.J., & Jarvis, T. (1994), Helping children understand technology. Adelaide: Department of Education and Children's Services.

Richardson, V. and Placier, P. (2001), *Handbook of research on teaching* Fourth Edition, Washington, DC, American Educational Research Association.

Rudd, Tim (2007), '*Interactive Whiteboards in the Classroom'*, [Online].

Available: www.futurelab.org.uk/events/listing/whiteboards/report

[Accessed 24th July 2009]

Schuck, S., and Kearney, M., (2007), *Exploring Pedagogy with Interactive Whiteboards.* University of Sydney, Australia.

Shulman, L.S. (1986), 'Those who understand: Knowledge growth in teaching'. *Educational Researcher*, 15 (2) 4-14.

Schulman, L.S. (1987), 'Knowledge and teaching: Foundations of the new reform'. *Harvard Educational Review*, 57 (1) 1-22.

Smith, A. (1999), Interactive Whiteboard Evaluation. Miranadnet.

Smith, F., Hardman, F. and Higgins, S. (2006), 'The impact of interactive whiteboards on teacher-pupil interaction in the National Literacy and Numeracy strategies', *British Educational Research Journal*, 32 (3) 443-457.

Smith, H. (2001), '*Smartboard Evaluation: Final Report'*, [Online].

Available: http://www.kented.org.uk/ngfl/whiteboards

[Accessed 19th October 2009]

Smith, H., Higgins, S., Wall, K. & Miller, J. (2005), 'Interactive Whiteboards: boon or bandwagon?', A critical review of the literature, *Journal of Computer Assisted Learning*, 21 (2) 91-101.

Smyth, G. (1999) '*The development of children's thinking skills using educational computer software in the context of English and Maths curricula for Second class in the Primary school'*. [Online].

Available: http://computing.dcu.ie/research/papers/MCE/1999/0799.ps

[Accessed 22nd April 2009]

Smyth, J. (1987), Introduction: Educating teachers: changing the nature of pedagogical knowledge. In J. Smyth (Ed.), *Educating teachers: Changing the nature of pedagogical knowledge*, London, Falmer.

Somekh, B. & Davies C. (1991), 'Towards a Pedagogy for Information Technology'. *Curriculum Journal*, 2 (2) 153-168.

Somekh, B. (2000), 'New technology and learning: policy and practice in the UK, 1980-2010'. *Education and Information Technologies*, 5 (1) 19-37.

Somekh, B. et al. (2005), Interim Report to the Department for Education and Skills. Unpublished report from the SWEEP project.

Stein, J., Mc Robbie, C., & Ginns, I. (1999), '*A Model for the Professional Development of Teachers in Design and Technology'. Paper presented at the annual conference of the Australian Association for Research in Education*. February 1999, Australia: University of Queensland.

Stephens, D., Gaffeney, J., Weinzierl, J., Shelton, J. & Clark, C. (1993), Toward understanding teacher change (Technical Report No. 585, ERIC Document Reproduction Service No. ED 361667).

Stephens, C.D., (2000), 'Forget the sailboard – let's go whiteboarding!', *Dental Update*, 27 (5) 236-240.

Strong-Wilson, T. (2008) 'Changing literacies, changing formations: the role of elicitation in teacher action research with new technologies', *Teachers & Teaching*, 14 (5) 447-463.

Tanner, H., Jones, S., Kennewell, S. and Beauchamp, G. (2005), Interactive whiteboards and pedagogies of whole class teaching, Mathematics Education Research Group of Australasia Conference 28, Melbourne: MERGA 28.

Trench, S. (2008), *'Using electronic storybooks to support children's language development and their emergent literacy levels'*, [Online].

Available:

https://www.cs.tcd.ie/~trenchs/portfolio/Finallitreview SandraTrench.doc

[Accessed 24th March 2009]

Tuckman, B. W. (1972), *Conducting Educational Research*. New York, Harcourt Brace Jovanovich.

Venn, W. (1995), Factors affecting the use of computers in the classroom: four case studies. In Watson D. And Tinsley, D. (eds) (1995) *Integrating Information Technology into Education* (pp 169-216), London, Chapman and Hall.

Vygotsky, L. (1978), *Mind in Society: The Development of Higher Psychological Processes*. Cambridge MA, Harvard University Press.

Waring, J. (2007), 'Adaptive regulation or governmentality: patient safety and the changing regulation of medicine', *Sociology of health & illness*, 29 (2) 163-179.

Whitty, G. (2000), 'Teacher Professionalism in new times', *Journal of In-Service Education*, 26 (2) 281-95.

Wilson, N. & Mclean, S. (1994), *Questionnaire Design: a Practical Introduction.* Newtown Abbey, Co. Antrim: University of Ulster Press.

Witzenried, A. (2004), *'ICT and learning – back to the future?'*, [Online]. Available: http://www.iwb.net.au [Accessed 24th March 2009]

Wood, C. (2001), 'Interactive Whiteboards: a luxury too far?' *Teaching ICT*, 1 (2) 52-62.

Zuber-Skerritt, O. (1996), Introduction. In O. Zuber-Skerritt (ed.) *New Directions in Action Research*. London, Falmer.

Appendices

Appendix A – Research Letter to School

Dear Principal,

As you are aware, I am conducting a post graduate research thesis in the area of Digital Media Development for Education.

The title of my thesis is *"The Interactive Whiteboard in an Irish Primary School, a catalyst for pedagogic change?"*.

It is proposed that my research will involve interviews with both staff members. There will also be a period of classroom observation. With regards to confidentiality and anonymity, please be assured that strict guidelines will be adhered to at all times.

I would truly appreciate it if the school can assist me in this study.

Thanking you in advance,

_____

Neil Crowley

Appendix B – Consent Letter to Teachers

Dear Teacher,

I am conducting a post graduate research thesis in the area of Digital Media Development for Education.

The title of my thesis is *"The Interactive Whiteboard in an Irish Primary School, a catalyst for pedagogic change?"*.

As part of the research, it will involve teacher's being interviewed and subsequently observed teaching in a classroom environment.

I believe the findings of the study may be of great benefit in general.

Therefore, I would be grateful if you could complete the following consent form.

Thanking you in advance.

_____

Neil Crowley

==========

Do you wish to take part in this study?

Yes ☐

No ☐

Signed: _____

Date: _____

Appendix C – Consent Letter to Parents

Dear Parent/Guardian,

I am conducting a post graduate research thesis in the area of Digital Media Development for Education.

The title of my thesis is *"The Interactive Whiteboard in an Irish Primary School, a catalyst for pedagogic change?"*.

As part of the research, it will involve children being observed in a teaching situation within the classroom.

I would be grateful if you could complete the following consent form.

Thanking you in advance.

_____

Neil Crowley

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Do you allow your child to take part in this study ?

Yes ☐

No ☐

Signed: _____

Date: _____

Appendix D - SCOTS Rating Schedule

1. Directness of Teacher Control of Pupil's Learning Activities

1)	Control of pupils by teacher is entirely direct. The pupils show no indication of training in managing work activities.	
2)	As '1'except that in a limited context, a significant proportion of the class operate in ways showing a lesser dependence upon the teacher.	
3)	Although the teacher intervenes to a great deal to maintain the operation of the working system, pupils also show a substantial competence in work management. Most pupils show themselves able and willing to sustain even non-routine work for at least a short while in the absence of the teacher or in the absence of teacher support.	
4)	As '5', except that the role of the teacher in keeping the wheels turning is rather more apparent. In particular the teacher apparently finds it necessary to intervene from time to time.	
5)	There are very few signs of direct teacher control of pupil's work activities (other than basic instructions infrequently given, concerning work to be undertaken) and yet nearly all pupils work purposefully, knowing how to operate the system in use.	

2. Pupil Responsibility for Work

1)	Pupil has no control of own work. Tasks are almost always instructed by the teacher. The time spent is entirely controlled by the teacher, as is the way in which the work is undertaken.	
2)	As ‘1’except that sometimes, more than one task is instructed by the teacher at a time. When more than one task is instructed, the pupils have to do them in a given sequence and the teacher often intervenes to ensure that time spent on each task is that intended.	
3)	Most work is instructed by the teacher as in ‘1’ and ‘2’. Pupils are sometimes given responsibility either over a short period for allocating time to each of a small number of tasks and for determining their sequence or for a longer period for allocating time to tasks but not controlling their sequence.	
4)	Pupils are given a programme of work to be covered over a period of time. The distribution of time is left to the pupils save that the teacher may intervene whenever a pupil is devoting too much time to any one activity with the result that the amount and quality of work in other areas is suffering. The intervention normally takes the form of direct instructions as to what the pupil is to do.	
5)	As ‘4’. Except that teacher intervention is infrequent and different in type. Therefore, the teacher does not intervene until there is evidence available that a pupil’s work is suffering through failure to allocate time satisfactorily.	

3. Authoritarian/Democratic Practices

1)	Teacher totally authoritarian. The work to be undertaken is determined by the teacher without even a semblance of consulting pupil wishes or allowing pupil choice.	
2)	As ‘1’except that limited degree of pupil choice may be permitted in very limited contexts (e.g. projects, art, selecting work-card from a prescribed set)	
3)	Practice varies: whereas some children are treated as in ‘4’ (or even ‘5’), approximately as many are treated as in ‘2’ (or even ‘1’)	
4)	Children are encouraged to express preference for work topic and/or work mode (even though choice may be from a restricted range of options and may be very limited in material effect).	
5)	As ‘4’. Except that children often make suggestions that are taken up by the teacher and that have an effect on the work of the class that is more than nominal.	

4. Fostering a Sense of Responsibility

1)	Pupils have no responsibility for their actions. If pupils are given any duties to perform, these are given as chores rather than responsibilities and the teacher closely supervises their execution.	
2)	As '1'except that a selected minority of pupils is trusted to perform chores without direct supervision. Even these pupils, however, are subject to the teacher's checking that assigned duties have in fact been carried out.	
3)	Pupils given duties to perform are not closely supervised but are expected to perform them well and responsibly. On the other hand, teacher makes no attempt to foster responsibility duties being allocated only to those showing signs of wanting them or thought likely to perform them well. Any pupil found not to have acted responsibly is however, 'written off' for a considerable time.	
4)	Teacher makes an effort to make pupils responsible individuals. Duties and responsibilities are widely spread throughout the class. Tasks are not matched pupil's interests and abilities. The teacher being less sensitive to such matters than in '5'. Consequently, some pupils are likely to find themselves with responsibilities they do not wish to have.	
5)	The teacher apparently effortlessly allocates to all pupils duties well matched to their interests and capabilities and guides them. Even the most unpromising pupils get something appropriate to do.	

5. Constraint on Movement

1)	Most pupils not allowed to leave seats unless instructed by teacher.	
2)	Most pupils free to move to teacher or for assigned functions, but no other voluntary movement allowed.	
3)	Most pupils free to collect required materials.	
4)	Most pupils free to move to co-operate with other pupils or to work in other areas of room.	
5)	Most pupils free to visit areas outside the classroom for task related purposes.	

6. Freedom of Access to Resources

1)	Pupils have access to no materials other than those specified (or laid out) by the teacher for the immediate task. Requests for additional materials are usually not granted.	
2)	In addition to those materials specified (or laid out) by the teacher for the immediate tasks, pupils may, on request, be allowed additional materials if the teacher is satisfied of a genuine need for them.	
3)	Teacher tends to specify the basic materials required for each task but responds readily to reasonable requests for additional ones and/or permits free access at all times to a limited range of additional items.	
4)	A wide range of materials is in regular use and is freely available to pupils. However, there are certain materials and/or storage locations that may be accessed by pupils only when specifically instructed by the teacher.	
5)	Pupils have free access to all communal materials, although they may be instructed as to how and when scarce materials should be used.	

7. Clarity of Basic Principles

1)	When explaining any point, the teacher presents facts in such a way that the underlying principles will not be apparent to anyone not conversant with them already. Irrelevant facts may be brought in and essential ones omitted.	
2)	When explaining any point, the teacher relates facts presented to underlying principles to some degree, but the stress is on either the practical/mechanical or the superficial rather than the basic principles.	
3)	When explaining any point, the teacher presents the facts in a clear logical order so that the underlying principles are made readily apparent or alternatively presents principles and applies them to cases so that the nature of the principles is made apparent.	
4)	As '3', save that the teacher is sensitive to the types of difficulties experienced by many pupils and appears to be able to pin-point most of the areas of difficulty experienced by individual pupils and to deal with these simply, clearly and appropriately.	
5)	Insufficient exposition to permit coding.	

8. Inventiveness of Explanation

1)	If initial explanation is unsuccessful the teacher repeats the original explanation, no sign of trying a different approach.	
2)	Most points are explained in only one way, but there are occasional cases of an alternative explanation or mode of exposition.	
3)	Teacher explains most points in more than one way to aid pupil comprehension, but no great inventiveness displayed, the types of explanation are fairly stereotyped.	
4)	Teacher uses a variety of ways of explaining most points, endeavouring to overcome most of the failure of comprehension, these ways are characterised by considerable inventiveness.	
5)	Teacher uses a great variety of ways of explaining, endeavouring to find some way of overcoming every difficulty experienced by pupils, these ways are characterised by great inventiveness.	

9. Stimulativeness/Dullness of Teaching

1)	Teaching/teaching situation is dull and unstimulating: teacher apparently bored, weary, or uninterested in task or class.	
2)	Teaching/teaching situation evokes only occasional interest in pupils; pupils unlikely to sustain concentration and effort.	
3)	Teaching/teaching situation evokes fairly consistent interest in most pupils for much of the time but the pupil's enthusiasm is not aroused.	
4)	Teaching/teaching situation is bright and interesting; teacher's interest and enthusiasm is communicated to the class.	
5)	Teaching/teaching situation is outstandingly bright, interesting and challenging. A	

10. Encouragement/Prevention of Difference

1)	The work of the class is characterised by conformity to the teacher's dictates. In consequence, inventiveness, discovery and doing things differently are prevented or strongly discouraged. Suggestions from pupils not welcomed and not used.	
2)	Suggestions from children are listened to and kindly deal with but rarely, if ever, used. Teacher seems to be paying 'lip service' to idea of participation but in fact shows why his ideas are better without permitting children to find this out for themselves. Thus, in practice, the pupils have to follow the teacher's dictates.	
3)	The work of the class is characterised by a fair degree of conformity in that the teacher, while not preventing, rarely encourages inventiveness, discovery, or doing things differently. Difference is therefore able to occur but is unlikely to manifest itself often or in many pupils but may possibly give substantial encouragement within one or two subject areas, probably ones thought peripheral.	
4)	Teacher encourages children to suggest ideas for work and ways of carrying out work. Inventive individuals are encouraged to try out their ideas and consider the appropriacy of them. Teacher does not always insist on conformity of work and work method – however teacher normally suggests basic approach to work so that those devoid of ideas may participate.	
5)	The work of the class is characterised by very little conformity and the teacher strongly encourages curiosity, discovery, and inventiveness and differences in learning mode are commended if at all sensible.	

Appendix E – Interview Questions

Teaching & Background
• How many years have you been teaching?
• What number of schools have you worked in prior to this school?
• How many years are you teaching in this school?
• What classes have you taught throughout your career?
• Which did you prefer?, Why?
• What qualities are important as a teacher?
• What type of teacher are you?
• Has the revised curriculum created greater demands and responsibilities on you as a teacher? What are they and how have you adapted to this?

ICT within the Classroom
• What do you think of the role of ICT within education?
• How do you feel about using ICT within education?
• What is your role in relation to ICT in the school and what have you done to incorporate it within the classroom?
• How often would you collaborate with other teachers regarding the use of ICT ?
• Do you feel that the uptake of ICT needs to be encouraged among teachers? What are your reasons for your response?
• Who was the main influence in encouraging the introduction of IWBs in the school?
• What is your opinion of Interactive Whiteboards (IWBs) ?
• Do you use other methods of technology in the classroom?, Do you feel they are better than the IWB?, Why?

Pedagogy within the Classroom
• Do you use the IWB for all of your teaching day?, Why?
• How did you teach prior to the introduction of the IWB?
• Is there any curricular area in which you tend to use the IWB more frequently?
• ICT has the potential to transform learning when integrated appropriately, would you agree with this statement and why?
• What do you feel are the challenges to integrating IWBs in the classroom?
• How has your planning and preparation changed, since the IWB has been introduced into the classroom?
• How do you feel that the use of the IWBs in the school has affected the ways in which you teach at the moment?
• Do you feel that as you become more experienced in the use of the IWB, it has changed your type of teaching?
• Do you feel you have changed your style of teaching or have you mostly adapted the IWB within your existing practice?

• What is your understanding of the term interactive teaching?
• How do you think the IWB has led to improvements in classroom management?
• The use of technology by the pupils in the classroom, is reflected by the teachers own enthusiasm and confidence. What are your opinions about this statement?

Professional Development
• How do you define professional development?
• What professional development opportunities have you undertaken in the last number of years?
• What training and support did you receive in relation to your needs?
• How important is professional development within the teaching profession? What is your attitude towards this?
• What encouragement and support in the area of professional development do you believe one should receive from a school/BOM ?
• Do you feel that this would influence a school's progress and development? Why?
• Do you feel that more training would result in better use of the technology amongst teachers? How do you think this would be best achieved?

Attitudes and Beliefs
• What values, beliefs and practices do you have which you would encourage in a new teacher?
• How did your training in the colleges of education, help you to prepare for the changing nature of teaching?
• As a teacher, what do you feel needs to be done in order to see improvements within the quality of teachers in the colleges of education?
• Some people maybe reluctant to embrace change within the educational context. Why do you think this is?
• How confident are you in implementing change?, In what ways do you believe people are empowered by others to incorporate change?
• What are your professional views regarding teaching, how do you feel that your views have influenced your teaching?
• In what ways do you feel people may resist the use of ICT in the classroom?
• Would you consider support between staff and management is important in implementing change in a school? What do you feel this way?