

ULRR

A comparative case study investigating the effectiveness of interactive whiteboard's as motivational teaching and learning tools in the primary school

Item Type	Thesis
Authors	Walsh, Moya
Download date	2026-05-13 01:22:15
Item License	https://creativecommons.org/licenses/by-nc-sa/1.0/
Link to Item	https://hdl.handle.net/10344/3576



UNIVERSITY *of* LIMERICK

OLLSCOIL LUIMNIGH

**A Comparative Case Study Investigating the Effectiveness of
Interactive Whiteboard's as Motivational Teaching and Learning
Tools in the Primary School.**

Moya Walsh

Master of Arts in Digital Media Development for Education

University of Limerick

Supervisor: Kenneth Rea

Submitted to the University of Limerick, October 2013.

Declaration

I declare that this thesis is entirely my own work and has been referenced properly to work done by reported by others. It has not been submitted for any other academic award or part of, at this or any other educational institution. I agree that this thesis may be made available by the University of Limerick to future students.

Signature: _____

Date: _____

Abstract

A Comparative Case Study Investigating the Effectiveness of Interactive Whiteboard's as Motivational Teaching and Learning tools in the Primary School.

Moya Walsh

This comparative case study aimed to examine the effects of using Interactive Whiteboards for teaching and learning in primary schools. The research study was two-fold; firstly it set out to examine the effects of using IWB's as teaching and learning tools as opposed to traditional teaching methods. Secondly, it wanted to determine the motivational effect of the IWB on student learning. Fifteen primary schools throughout North Tipperary participated in the study. Participants of the study consisted of thirty primary school teachers and one hundred and twenty primary school students.

In order to establish the effect of using IWB's as opposed to traditional teaching methods a comparative case study was conducted between two groups of twenty seven students of similar age and learning ability. Seventy five primary school students completed the student survey and thirty primary school teachers responded to an online teacher questionnaire. Other data collected included classroom observations of students while learning from the IWB, a focus group interview with six primary school teachers and an interview with a primary school principal.

The study found very little difference between the comparative case study groups with regard to performance and that ultimately the enhanced quality of the learning arose from increased motivation and interactivity rather than any evidence of greater learning. The views of teachers and students regarding the motivational effect of Interactive Whiteboards were positive with many attributing this to the specific interactive and presentation capabilities of the board. Although the findings of this study suggest IWB's can enhance student engagement and motivation, it is the nature in which the board is used, in particular when students are interactively involved in lessons that determines this enhanced engagement. The research also concluded that implementation of the Interactive Whiteboard into teaching and learning has drawbacks in particular with regard to training and technical support. A key finding of this study regarding effective implementation was the need for teacher collaboration namely in the sharing of resources and expertise for use with Interactive Whiteboards.

Dedicated to Liam, Méabh, Orlaith and Féilim.

Acknowledgements

With thanks to my supervisor Kenneth Rea for his guidance.

I would like to thank the Board of Management, Teachers and Students for agreeing to participate in this research study.

I would also like to thank my extended family and friends for their support and encouragement during the last year.

Particular mention goes to my family, without whom I couldn't have completed this study. To Liam, for his constant love and support as well as technical advice, to Méabh who sacrificed her summer freedom to help out her mother and to Orlaith my pilot 'guinea pig' for her help and encouraging words of support.

Table of Contents

Declaration.....	i
Abstract.....	ii
Acknowledgements.....	iv
Table of Contents	v
List of Appendices	ix
List of Abbreviations	x
List of Figures.....	xi
List of Tables	xii

Chapter 1 Introduction..... 1

1 Introduction.....	1
1.1 Research Background	1
1.2 Statement of Topic.....	1
1.3 Research Development	2
1.3.1 Research Questions	2
1.3.2 Research Context	2
1.4 Research Methodology	2
1.5 Limitations	3
1.6 Research Structure	3

Chapter 2 Literature Review 4

2.1 Introduction.....	4
2.2 Information and Communications Technology in Education.....	5
2.3 The Role of ICT in the Primary Curriculum.....	7
2.4 Interactive Whiteboards	9
2.5 Research on Interactive Whiteboards	10
2.5.1 Potential of Interactive Whiteboards	11
2.6 Learning Theories	13
2.6.1 Behaviourism	13
2.6.2 Constructivism	14

2.7 Interactive Whiteboards Impact on Teaching and Learning.....	14
2.8 Implications for the Teacher	16
2.9 Teacher Attitudes of IWB's	19
2.10 Student Attitudes of IWB's.....	21
2.11 Motivational Impact of IWB's.....	23
2.12 Barriers to IWB Implementation	24
2.13 Conclusion	25
Chapter 3 Research Methodology	27
3.1 Introduction.....	27
3.2 Approaches to Educational Research.....	27
3.2.1 Case Studies	27
3.2.2 Action Research	27
3.2.3 Ethnographic Research	28
3.2.4 Observational Research	28
3.2.5 Comparative Research	28
3.2.6 Research Method in this Study	29
3.3 Purpose of Research.....	29
3.4 Research Setting.....	29
3.4.1 Research Participants	30
3.4.1.1 Student Participant Selection Criteria.....	31
3.4.1.2 Adult Participant Selection Criteria	31
3.5 Research Questions.....	31
3.6 Research Methodology	32
3.6.1 Quantitative and Qualitative Studies	32
3.6.2 Comparative Case Study.....	32
3.7 Research Collection Tools	33
3.8 Theory and Development of Data Collection Tools	34
3.8.1 Testing.....	34
3.8.2 Questionnaire and Survey	34
3.8.3 Interviews.....	35
3.8.3.1 Principal Interview.....	36

3.8.3.2 Focus Group Interview	36
3.8.4 Observations	37
3.8.5 Piloting Research Tools	38
3.8.6 Research Timeline	38
3.9 Data Analysis Considerations	39
3.9.1 Triangulation	39
3.9.2 Reliability and Validity.....	40
3.9.3 Ethics.....	41
3.9.4 Research Limitations	41
Chapter 4 Findings.....	43
4.1 Introduction.....	43
4.2 Section One.....	44
4.2.1 Profile of Student Participants	44
4.3 Testing Structure.....	44
4.3.1 Pre and Post Testing of Control Group.....	44
4.3.2 Pre and Post Testing of Experimental Group	45
4.4 Section Two	47
4.4.1 Motivational Impact of the IWB.....	47
4.5 Section Three	56
4.5.1 Perceived Benefits of the Interactive Whiteboard	56
4.5.2 Perceived Drawbacks of the Interactive Whiteboard	57
4.6 Teacher Collaboration.....	59
4.7 Conclusion	59
Chapter 5 Discussions of Key Findings.....	60
5.1 Introduction.....	60
5.1.1 Overview of Research.....	60
5.1.2 Key Findings.....	61
5.1.3 Presentation of Findings for Discussion	62
5.2 Quality of Learning form the IWB	62
5.3 Enhanced Motivation Effect of the IWB	63

5.4 Findings regarding Implementation of IWB.....	65
5.5 Conclusion	67
Chapter 6 Conclusion	69
6.1 Introduction.....	69
6.2 Outcomes of the Comparative study.....	69
6.3 Recommendations.....	70
6.4 Future Research in the area	71
6.5 Conclusion	71
Bibliography	72

List of Appendices

Appendix A: Letter requesting permission from Board of Management.

Appendix B: Information letter to Teachers

Appendix C: Information and Permission letter to parents

Appendix D: Information letter to Focus Group Teachers

Appendix E: Teacher Attitude to IWB Questionnaire

Appendix F: Student Attitude to IWB Survey

Appendix G: Pre/Post Test

Appendix H: Lesson Plan for Control Group Teacher

Appendix I: Lesson Plan for Experimental Group Teacher

Appendix J: Focus Group Interview Transcript

Appendix K: Observational Field Notes

Appendix L: Pictures of Children using The IWB

Appendix M: Additional Graphical Analysis of Empirical Data

List of Abbreviations

BECTA	British Educational Communications and Technology Agency
CBI	Clár Bhána Idirghníomhacha
CG	Control Group
EG	Experimental Group
ICT	Information and Communication Technology
IWB	Interactive Whiteboard
MIC	Mary Immaculate College
NCCA	National Council for Curriculum and Assessment
NCTE	National Centre for Technology in Education
NDP	National Development Plan
PSWE	Primary Schools Whiteboard Expansion Project

List of Figures

Figure 3.1 Research Timeline

Figure 4.1 Control Group Test Comparisons

Figure 4.2 Experimental Group Test Comparisons

Figure 4.3 Percentage Increase Comparisons of Control and Experimental Groups

Figure 4.4 Ranked Benefits of IWB's

Figure 4.5 Teacher Response to Student Increased Attention and Motivation

Figure 4.6 Teacher Response to IWB's making learning fun

Figure 4.8 Students response to level of interest in IWB

Figure 4.9 Student responses to learning from IWB

Figure 4.10 Teacher Responses to novelty factor

Figure 4.11 Student responses to IWB usage in class

Figure 4.12 Ranked disadvantages of IWBs

Figure 4.13 Comparison of Control and Experimental group pre-test results

Figure 4.14 Comparison of Control and Experimental groups post test results

Figure 4.15 Comparison of Control group pre and post test

Figure 4.16 Comparison of Experimental group pre and post test result

Figure 4.17 Teacher Response to student use of IWB

Figure 4.18 Teacher responses to use of IWB

Figure 4.19 Student responses to importance of IWB use

Figure 4.20 Student responses to interest in learning from IWB

Figure 4.21 Students response to learning with IWB's

Figure 4.22 Student responses to IWB technical problems

List of Tables

Table 3.1 Breakdown of participants for data collection tools

Table 3.2 Selection of data collection tools for research areas

Table 4.1 Test Results and Percentage Increase

Chapter One

Introduction

1.1 Research Background

In 2007 the Department of Education and Skills issued a report to outline priorities of Information and Communications Technology (ICT) in Education. This report *'Investing Effectively in Information and Communication Technology in Schools 2008-2013'* had recommendations on the necessary ICT provision to schools in order to ensure that teachers can make meaningful use of ICT in their work. The researcher's primary school felt the challenge to incorporate and use more ICT was enabled through the purchase and installation of Interactive Whiteboards (IWBs). Over the last five years the researcher's school has invested in Interactive Whiteboards for all classrooms. This has brought many changes to the classroom and there is a general enthusiasm from students and teachers alike regarding its capabilities. The children from junior classes refer to it as 'the magic board' and enjoy 'playing' with it. It has also changed the methodology of many of the lessons a teacher delivers. Prior to this inclusion, classrooms had a single computer which was used for computer stories, games and referred to occasionally for referencing or videos from the web and by individual pupils for word processing. The process of adopting and implementing the IWB into teaching and learning is heavily dependent on the individual teachers training, previous knowledge and confidence in using ICT. Therefore teachers are at varying levels of adoption with some more competent than others.

1.2 Statement of Topic

A growing number of schools have been incorporating Interactive Whiteboards (IWB's) into their teaching methodology in recent years therefore the rationale of the researcher was to measure and analyse the effectiveness of the IWB as a motivational teaching and learning tool in the primary school. This study was labelled a comparative case study in that it endeavoured to measure the effectiveness of IWBs as primary school teaching and learning tools as opposed to traditional teaching methods. It also strove to highlight the views of the research participants regarding the IWBs motivational impact along with the perceived benefits and drawbacks of its use in the primary setting.

1.3 Research Development

1.3.1 Research Questions

The purpose of this study was to examine the effectiveness of the IWB as a motivational teaching and learning tool in the primary school. The study aimed to examine and determine the following research questions:

1. Are IWBs effective teaching and learning tools in Primary Schools?
2. Does the IWB have any effect on student motivation to learn?
3. What do primary school teachers and students perceive to be the benefits and drawbacks of using the IWB in the classroom?

1.3.2 Research Context

This research study was carried out with thirty primary school teachers from fifteen different primary schools in North Tipperary and one hundred and twenty primary school students from juniors to sixth class from two primary schools in North Tipperary. All participants had an IWB in their classroom.

1.4 Research Methodology

This comparative case study used a mixed method approach using both quantitative and qualitative methods to gather data. Quantitative data collection tools such as testing and questionnaires were used to research the effectiveness of the IWB as a teaching and learning tool. A small scale comparative study was carried out with two groups of 4th class children, one group labelled the experimental group were taught a lesson from an IWB the other group labelled the control group were taught an identical lesson using a traditional approach. Both groups participated in a pre-test before lesson exposure and there followed a post-test to assess learning. Participating students and teachers also completed surveys and questionnaires on attitudes to IWBs. To further research the motivational aspect of the IWB

as well as the attitudes of its users namely students and teachers, observations of classroom use of the IWB took place and primary school teachers and a school principal participated in interviews.

1.5 Limitations

As the IWB is a relatively new classroom teaching tool and currently student enthusiasm is high with regard to using them. Students may feel they have to respond positively therefore findings must be carefully interpreted. The teacher questionnaire has the minimum sample size of thirty participants, a broader sample size may have reflected differently. As with all case studies the results of this study will fit the context and therefore cannot be generalised for other primary settings.

1.6 Research Structure

Chapter One: The Introduction outlines the research background, questions, context and relevance of the study.

Chapter Two: The Literature Review explores summaries and evaluates the existing literature on ICT in Education and in particular on IWB's use in education. It investigates the potential of the IWB and its impact on teaching methodology. It examines the attitudes of teachers and students on classroom use of IWBs and includes literature which explores the motivational aspect of IWB's. It also outlines the perceived benefits and drawbacks of IWB implementation in schools.

Chapter Three: Research Methodology outlines the research environment and participants. It presents the methodology and data collection tools used for this study. It also outlines the reliability and validity of the research study.

Chapter Four: Research Findings presents the findings from this study in relation to the research questions.

Chapter Five: Discussion of key Findings examines findings in relation to the literature review in chapter two.

Chapter Six: Conclusion reviews the research questions and proposes recommendations for further research of IWB's in primary schools.

Chapter Two

Literature Review

2.1 Introduction

Over the last decade primary schools throughout the country have been investing in Interactive Whiteboards (IWBs) as teaching and learning tools. The main reasons for choosing this form of technology include their associated positive research and the push from government policy '*Smart schools for a smart economy*' 2009, along with the increasing choice of interactive resources. Many primary schools have felt an expectation to install and implement IWBs as a result of political initiatives to increase ICT usage in schools. The IWB has been internationally adopted into education and there is a wide body of research conducted on their associated teaching and learning benefits. In the United Kingdom they have been implementing them into teaching pedagogy since the year 2000. In 2003, with the Primary Schools Whiteboard Expansion Project (PSWE), a UK government initiative provided funding to schools for the acquisition and use of IWBs. The introduction of IWBs was seen as a way to integrate technology into teaching in primary schools for whole class interactive teaching. In Ireland primary schools are at various stages of adoption. Many schools have embraced the technology and are generally positive about their use in teaching methodology.

The literature review explores the major theories and prominent authors of previous research in the field relating to IWBs and their use in Education. It broadly looks at the history of ICT in education and then narrows the research findings to date as regards Interactive Whiteboard use in the primary School system. It further explores any research conducted that links IWBs with increased learning and furthermore, studies that suggest increased motivation levels for learning. In doing so the author hopes to illustrate what is already known in the area.

2.2 Information and Communication Technology in Irish Education

The introduction of Information and Communication Technology in Irish education goes back to the 1970s when it first began to be incorporated into the education sector. Early initiatives were no more than summer in-service computer courses for teachers. There followed a number of initiatives, however attempts to fully integrate ICT into curriculum have been less than successful.

Ireland lags significantly behind its European partners in the integration of Information and Communication technologies (ICTs) into first and second level education. The need to integrate technology into teaching and learning right across the curriculum is a major national challenge that must be met in the interests of Ireland's future economic wellbeing (Department of Education and Science 1997 p.1).

In 1998, the Department of Education introduced '*ICT in Schools Initiative*'. This initiative resulted in significant progress in the development of ICT infrastructure in schools (NCTE Census 2005). ICT integration was made a priority and became an integral part of the National Development Plan with funding of €183 million from the period 1998 to 2005.

Subsequent publications and funding for ICT in Schools was as follows:

- School IT 2000: A policy Framework for the New Millennium 1998; €52 million.
- Blueprint for the Future of ICT in Irish Schools 2000: €78 million
- Networking Schools 2004; €23 million
- Schools Broadband Programme 2005; €30 million

(NCTE Census 2005)

Although this funding was welcomed it was still found to be lacking. Schools required further resources to ensure effective ICT implementation.

Learning is changing. A pivotal force in bringing about this change is the use of information and communications technology (ICT) which provides richer, more immediate, world-relevant educational resources and opportunities. When used well, ICT enriches learning and enhances teaching. It invigorates classroom activities and is a powerful motivational tool that encourages learners to progress in more personalised and self-directed ways (Department of Education 2007).

In 2007 the Government appointed a strategy group to advise on the priorities of ICT in Education. This report *'Investing Effectively in Information and Communication Technology in Schools 2008-2013'* had recommendations on the necessary ICT provision to schools in order to ensure that teachers can make meaningful use of ICT in their work. The report found that while previous policy and funding had an impact and showed progress in that teachers showed a willingness to incorporate ICT into teaching and learning through the increase in participation of professional development in ICT programmes. They also concluded that further funding and provision of technical support was required.

While schools are equipped with some computers and have limited internet access, a lack of sufficient and sustained investment over recent years has resulted in inadequate and ageing ICT equipment in schools, no provision for technical support and inadequate levels of broadband internet (Department of Education 2007).

Recommendations included adequate ICT equipment, software and digital content for teaching and learning together with the technical assistance necessary to ensure schools could provide a functional and dependable ICT infrastructure to sustain a good quality service. It included the provision of a cost efficient broadband service, where access was to be made available to all learning areas with the school. The aim of such recommendations was to transform schools into e-learning environments and through innovative practice and research achieve a vision for digital technology which remained vibrant, relevant and at the forward edge internationally (Department of Education, 2007).

In November 2009, the Department of Education announced their €150 million plan *Smart schools for a smart economy*. The action plan included equipping each classroom in the country with a teaching laptop, digital projector and software over the following three years.

Our talented young people, the education sector and ICT are central to developing our 'smart economy'. Our children and teenagers are very comfortable with technology so we need to exploit the benefits of ICT in our classrooms to stimulate and enrich teaching and learning and develop students ICT competence (Department of Education, 16 November, 2009)

As part of the Government's strategy to make technology an integral part of the learning process, in 2010 the Department of Education issued grants of €24 million to 3,300 primary schools for high-tech equipment. Primary schools throughout the country received a block grant of €1,700 to purchase equipment (NCTE, 2010).

The Government recognises the need for investment in this area and is committed to providing funding to support the integration of information communications technology in teaching and learning in our schools. Primary schools will be asked to ensure that the recommended baseline equipment of a teaching computer with wireless mouse and keyboard and a fixed digital projector is installed in every classroom. This is in line with recommendations in the *smart schools smart economy* report (Department of Education, 2010).

Funding from the Department of Education's action plan '*Smart schools for a smart economy 2009*' seemed to correspond with the rise in take up of Interactive Whiteboards in many primary schools. The IWB offers schools and classrooms an interactive learning environment which was in line with Government recommendations for ICT investment in schools.

2.3 The Role of ICT in Primary Curriculum

In 1998, the National Centre for Technology in Education (NCTE) was established with the purpose of aiding the implementation of the Department of Education's ICT policy in schools. With the Education Act (1998) schools were required to develop Whole-School Plans that documented the school's educational philosophy and goals as well as how the school proposed to achieve these goals. In order to benefit from the Government's National Development Plan (NDP) Investment in education, schools were required to prepare and implement an e-Learning Plan as part of their whole school plan (NCTE, 2010).

The Primary School Curriculum was developed by the NCCA (National Council for Curriculum and Assessment) and launched in 1999. It identifies three primary aims of primary education:

- to enable the child to live a full life as a child and to realise his or her potential as a unique individual
- 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
- to prepare the child for further education and lifelong learning.

The curriculum is learner-centred. It emphasises the importance of literacy, numeracy, and language, while at the same time responding to changing needs in science and technology, social personal and health education, and citizenship (Curaclam na Bunscoile, 1999).

Both the NCTE and National Council for Curriculum and Assessment (NCCA) have developed materials and tools that Teachers can access online such as; the NCTE's scoilnet.ie, the NCCA's Action website, E-Learning Road Map, Guidelines for Teachers and the e-Learning Planning Handbook for Principals and ICT Co-ordinating Teachers. They provide access to current curricular information and access to digital content resources.

The NCCA's '*ICT Framework for e-Learning*' (NCCA, 2006) main objectives are:

- To create, communicate and collaborate with ICT.
- Develop ICT foundational knowledge, skills and concepts.
- Think critically and creatively with ICT.
- Understand the social and personal impact of ICT.

There can be no doubt that tremendous progress has been made both at the level of planning and implementation and of government policy with regard to ICT in education. However, a recurring flaw in various initiatives was that too little consideration was given to the pedagogical implications of ICT use. In addition, progress to date has been endangered by a failure to measure the effectiveness of ICT initiatives, insufficient qualitative research and pressures on the education budget nationally (Murray 2004).

A study of the Irish context by Cosgrove et al (2008) concluded that while computer resources in schools have improved with 86% of teachers having access to computers both in the classroom and at home and 100% of 5th and 6th class pupils surveyed reporting access to computers in schools (Department of Education Inspectorate, 2008), there is still a lot to be done with regard to the type and frequency of ICT usage in the classroom.

2.4 Interactive Whiteboards

Interactive Whiteboards are a popular technology in heavy demand by schools and practitioners. They offer transparent benefits to learning and teaching. That is, it is easy for institutions and teachers to recognise how IWBs enrich and enhance teaching and learning, something which may not always be so immediately transparent to practitioners in the use of other technologies (Becta, 2007 p.66).

An Interactive Whiteboard (IWB) is a large, touch-sensitive panel that connects to a digital projector and a computer, displaying the information on the computer screen. It resembles a traditional whiteboard and is used similarly. There are several brands of IWB's; all have one main function to allow the user access to the computer through the Whiteboard. The computer connected to the interactive whiteboard can be controlled by touching the board directly or by using a special pen. Such actions are transmitted to the computer instead of using a mouse or keyboard. Each brand also includes software, interactive tools such as pens and tablets for multiple users and provision of online resources to download. The use of these boards allows both the student and teacher to interact in a collaborative way thus enhancing the learning experience (Cogill, 2006).

Lemke & Fadel (2006) noted that descriptive studies of IWBs indicate three levels of whiteboard use:

1. To increase efficiency, enabling teachers to draw upon a variety of ICT-based resources.
2. To extend learning by using more engaging materials to explain concepts.
3. To transform learning by providing learning styles stimulated by interaction with the whiteboard.

The theoretical research base from the work of Lemke and Fadel (2006) indicates that the increased visualization, increased interactivity with students, and the increased reflective dialog among students and teachers around this focal point should contribute to learning.

2.5 Research on Interactive Whiteboards

There is wide body of research available on Interactive Whiteboards. Much has been claimed about their potential in teaching and learning. Benefits include greater interactivity between teachers and pupils, increased pupil engagement and motivation and increased attainment (BECTA 2003).

By the year, 2000, in the UK and many other European countries Interactive Whiteboards had become a common classroom resource. In the UK there was an expansion initiative involving IWB's.

The aim is to increase the provision of IWB's in schools to improve, develop and enhance effective pedagogy using ICT and demonstrate that IWB technology can make a significant positive contribution to embedding ICT in the classroom, raising standards through improved teaching and learning (BECTA, 2004 p 8).

In recent years, the Irish education system too has seen an upsurge in IWB use in the primary school system due to the funding from the Department of Education's action plan '*Smart schools for a smart economy 2009*'. According to statistics presented by David O'Grady Mary Immaculate College (MIC) Ireland in 2009 ranked fourth place after (UK, Denmark and Netherlands) in terms of classroom penetration of IWB's. His statistics were taken from 'Analysing the Future of Classroom Display Technology, July 2010, Futuresource Consultancy. That same report reported that 750,000 boards were sold worldwide in 2009, and the market was on track to one million sales in 2010.

Our research has shown there have been no real signs of recession in education technology. Few markets hold the promise of education, where we'll see very strong sales growth for at least the next five years. It's remarkable to see how IWB technology allows teachers to connect with students in much greater depth, bringing the outside world into the classroom and transforming lessons into exciting world experiences. That's the tangible component which continues to drive this market forward (Futuresource Technology, 2010).

Cláir Bhána Idirghníomhacha (Interactive Whiteboards) (2007) referred to Lord David Puttman in his keynote address at the Irish Teaching and Learning Festival, City West, October 15th 2010 reported that 43% of Irish classrooms have Interactive Whiteboards with 7,200 boards purchased in the previous twelve months alone which represents 20% of Irish classrooms [online]

Simon Lewis writer for anseo.net in an article dated 13th June 2012 estimated that 85%-90% of classrooms in Ireland have a projector or full IWB set up [online].

2.5.1 Potential of Interactive Whiteboards

Cuthell (2005) is one of a number of studies conducted on the potential of Interactive Whiteboards (IWB) for teaching and learning. This action research study was conducted over four years working with teachers and curriculum developers, covering five areas from the North East to South East of England. Cuthell, like previous prominent authors (Levy, 2002; Latham, 2002) found IWB technology to have the potential to meet the needs of a wide range of learners.

What the boards enable teachers to do is support the whole range of learning styles of the learners in the class. The learners themselves feel empowered: The ability to visualise and recall the lesson supports learning; the range of resources that can be embedded within the IWB lesson software and the interactivity itself has engaged almost all of the learners and enhanced their progress (Cuthell 2005).

A number of benefits have been identified such as the Interactive software enabling teachers to model abstract ideas and concepts in a variety of ways therefore developing pupils understanding (Edwards et al, 2002; Richardson, 2002; Miller 2003). They can represent a variety of different representations (Kennewell and Beauchamp 2007) through using the software to build flip charts, accessing the internet and importing presentations. Lessons using the IWB were found to capture and hold pupils attention more strongly than other classroom resources (Smith et al). A reduced need to write on the board meant quicker lesson pace thus enabling more work to be covered (Glover & Miller, 2001; Ball, 2003; Miller, 2003). Smoother lesson transitions were also identified (Latham, 2002; Ball, 2003) and the facility to save and re-use lessons aids in lesson reinforcement and extension (Glover & Miller, 2002).

Technology integration in the Irish Education system has greatly increased in recent years. Department of Education's Inspectorate Report 2005 on ICT in schools found only 4% of teacher's are using ICT on a daily basis in their classrooms. According to Anseo.net [online August 2012] in just a few short years this usage had increased to 92%.

Simon Lewis an Irish primary school teacher who writes for Anseo.net believes that using technology as teaching methodology 'breaks down the walls of the classroom' aiding collaboration in a wider sense. IWBs project computers and all their capabilities into the classroom. It enables students and teachers to collaborate with other teachers and students worldwide.

No longer do teaching methodologies have to take place with just the people in the room, now there are possibilities to extend conversations and collaborations with schools from anywhere around the world [online] August 2012

McKeown (2008) wrote of Interactive Whiteboards as 'kid magnets' in the world of Irish primary education. Noted benefits were the boosting of pupil concentration and making the learning experience fun, she suggests that this may be due to the boards interactive nature; 'children love the option of touching the board with their finger, special pen or wand to take part'. Another benefit which was highlighted was their saving facility. Interactive Whiteboards allow teachers to electronically save lesson notes, media etc. and reuse for future lessons.

The concept of the IWBs appealing to a wide range of learning styles can be linked to Gardners theory of Multiple Intelligences (1993). McKeown noted the children's enjoyment and engagement was due to that fact that they can touch the board. Gardner would say this type of learning would appeal to the bodily-kinaesthetic Intelligence; such learners can often perform a task much better after seeing someone else perform it and works well when actively involved in the learning experience. The IWB can be applied to all types of intelligences, its capability of adding sound would enhance the experience for learners of Musical rhythmic intelligence. Access to the wider world of nature via internet and software will appeal to those with naturalist intelligence. Interpersonal learners would enjoy the opportunity to work within a group for example using IWB to display presentations or project work. The visual aspect of the boards using multimedia and images will engage the learner of visual spatial intelligence.

Interactive games and puzzles will engage those with mathematical-logical intelligence. A learner of Verbal linguistic intelligence will respond well to lessons in which they need to listen, speak read or write. Gardners eighth and final intelligence; Intrapersonal Intelligence applies to those who enjoy research and can gain direct access to information on the IWB.

2.6 Learning Theories

In order to evaluate learning and how learning takes place, one must first examine the learning theories of Behaviourism and Constructivism. Behaviourism is a more traditional learning theory that is easily equated with book based learning. Constructivism on the other hand has strong links with interactive learning.

2.6.1 Behaviourism

Associated theorists of Behaviourism are; Watson, Thorndike and Skinner (1968).

Behaviourism as a learning theory is often referred to as directed instruction. Behaviourism is a traditional learning style where children are more passive learners. The teacher is the director of lessons and children follow using textbooks. Knowledge is transferred from teacher to students. Behaviourists place a heavy emphasis on memorisation of facts. Learning is defined by a change in the behaviour of the student.

Learning implies a change in the individual as a result of some intervention. It may be viewed as an outcome or as a process (Belkin and Gray, 1977, p.211).

There is also an emphasis on reinforcers, positive reinforcers are applied to encourage expected behaviour and negative reinforcers to discourage incorrect behaviour. It stresses the repetition of behaviours until it becomes automatic.

Skinner believed that more complex learning could be achieved by this process of contingencies and reinforcement.

Through successive stages in the shaping process, the contingencies of reinforcement being changed progressively in the direction of the required behaviour (Skinner, 1968).

2.6.2 Constructivism

The learning theory of Constructivism has strong links with interactive learning. Associated theorists of Constructivism are; Dewey, Vygotsky, Piaget, Bruner, Papert and Resnick. Constructivists believe that a personal interpretation is required in order for learning to take place. An emphasis is placed on discovery learning, learner being an active part in the process. The learner, as opposed to teacher should guide the experience. Knowledge is 'constructed' through a scaffolding of prior knowledge in the brain. Students are encouraged to question, interact and discover for themselves. This learning style embraces interactive learning involving digital media. Somekh (2007) found that the presence of the IWB in the classroom has potential to change the relationship between teachers and children. They can work together on collaborative tasks where the teacher can provide scaffolding. Seymour Papert (1993), one of the founding members of constructivism believed that students learning increased when they were active participants in their own learning. Where the teacher was facilitator in providing the students with the right tools and learning environment. Papert referred to computers as 'objects to think with'.

Tapscott, in his book '*Growing Up Digital: The Rise of the Net Generation*', argues that we are now in a digital era of learning. According to Tapscott, a transformation in learning is taking place from what he labels "broadcast" learning to "interactive" learning. No longer are today's generation of learners satisfied in being the passive recipients of the traditional teaching process, rather, they want to discover it for themselves by becoming interactive with the learning (Tapscott, 1998, p.127).

Interactive Whiteboards as teaching and learning tools allow for a constructivist approach to teaching, the interactive nature of the board enables children to learn 'by doing' becoming an active agent in their own learning.

2.7 IWB's Impact on Teaching and Learning

Interactive Whiteboards are a popular technology in heavy demand by schools and practitioners. They offer transparent benefits to learning and teaching. That is, it is easy for institutions and teachers to recognise how IWBs enrich and enhance teaching and learning, something which may not always be so immediately transparent to practitioners in the use of other technologies (Becta, 2007, p. 66)

The effect of ICT on learners' attainment depends crucially on the teacher, the pedagogical approach adopted, the ICT resources employed and the learning objectives intended (Cox & Abbott, 2004).

With the implementation of IWB's into the pedagogy of teaching and learning, researchers have identified a number of techniques for effective IWB use. McCormick & Scrimshaw (2001) indicated a need for more attractive presentation of materials to increase student motivation and achieve 'sustained' and interactive learning approaches. They felt that sustained interest for learning occurs with pupil and teacher interaction and teacher collaboration. Latane (2002) has suggested that interactivity with all technologies needs to be between pupil and pupil as well as between pupil and teacher.

Kennewell and Beauchamp (2007) conducted a small scale study on an Information and Communication Technology (ICT) rich primary school in South West Wales and found IWBs to be the predominant ICT tool used by teachers. IWBs emerged as having the most potential impact on learning and raising standards of attainment. The specific features of the IWB such as interactive presentation tools were found to support a more participatory pedagogy (Beauchamp, 2004). The researchers observed lessons using the IWB during which field notes were taken. Field notes were then explored for evidence of the impact of IWB on learning. The study found that teacher use of IWB software focused learners' attention. It also found that it was common for children to be keen to interact with the board and this further enhanced student engagement.

At these times, the pace of the lesson slowed considerably, but the continued high level of engagement of students was evident and the reaction of the class indicated that all or most students were thinking along with the selected student about what the best action would be (Kennewell & Beauchamp, 2007, p. 234).

Kennewell and Beauchamp (2007) noted that teaching tended to follow a 'four-phase' lesson. The first phase was generally teacher led with a whole class activity on the IWB. Phase two introduced and developed skills; here new material was introduced through a scaffolding approach where all students could participate, watching a display, experiencing a variety of representations, interacting physically with board and responding to questions. Phase three involved group work or collaborative work and practice of related skills, IWB use not usual here. The final phase revisited key teaching points and review along with reflective activity.

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 pupils learning to one where students learn collaboratively and where in the main pupils construct or discover knowledge themselves (Department of Education 2009).

Miller et al. (2004a) after a two year Nuffield-funded study of IWB in secondary mathematics teaching, identified six common ‘manipulations’ of IWB to enhance interactivity between teacher, material and pupils:

1. Drag and drop
2. Hide and reveal
3. Colour, shading and highlighting
4. Matching equivalent terms
5. Movement or animation
6. Immediate feedback.

These manipulations and access to multi-media can allow for an engaging as well as an active learning experience in the classroom. Vygotsky’s (1978) ‘zone of proximal development of social interaction’ states that social learning leads to cognitive development. The interactive nature of the board aids collaborative work with teachers and students where all can learn with and from each other.

2.8 Implications for Teacher

The IWB techniques or manipulations were found to support learning but they also added that ‘technology should not be seen as an end in itself’ rather as one method of achieving learning goals (Higgins et al, 2007, p.217).

In short it would appear that the effective use of IWB in enhancing attainment hinges upon the progress made by teachers in harnessing the additional power of the technology to prompt analysis of the learning process in the teacher, and the appreciation of the concepts and applications by the pupil (Miller et al., 2004 a, p.2).

Armstrong et al, (2005) presented results of a case study which aimed to capture and analyse the complex interactions which occur between students, teachers and technology in the classroom. Their case study highlighted the fact that IWBs in classroom involves much more than mere installation of the board and associated software and found teachers to be critical in

ensuring integration of technology to promote classroom interactivity. They argued that training and on-going support is required for teachers to appropriately use the technology and concluded that potential of IWB are often not realised. Ensuring teachers have access to technical assistance and educational development and training regarding IWBs would increase their potential and effective use in the classroom.

The introduction of interactive whiteboards has produced a profound shift in the ways in which teachers think about what they do and why they do it- in other words, about the nature of what it is to be a teacher: the existential reality of teaching (Cuthell, 2005, p. 4).

The introduction of IWB technology has impacted on teachers and on their teaching methodology. It has been argued that in order for successful use of IWBs technology changes need to occur and greater flexibility is needed with regard to curricula and standards.

A shift away from traditional teacher and pupil roles in the classroom may be necessary. Changes in these areas might help to create an educational climate that is conducive to the effective, imaginative and innovative use of IWB (Hall & Higgins, 2005).

Teachers who have embraced the new technology and have adapted their teaching style have found it to enhance the learning environment of their classroom (Miller et al, 2004; Glover et al, 2005; Smith et al, 2005; Cogill 2003; Clemens et al 2001). However they and others (Harrison et al. 2002; Mulkeen, 2003; Hall & Higgins, 2005) have also found that the transition to IWBs needs both time and support. Without sufficient training and support teachers lack the confidence to use the technology and are therefore unable to integrate it effectively into teaching methodology.

However, in only a small proportion of schools are whiteboards being used to their full effect. In many schools too few staff, have had sufficient training to gain confidence in their use or to take any imaginative steps in using the technology to meet the special needs of their pupils (Hall & Higgins, 2005).

Mulkeen 2003, in his research of ICT integration in Irish Education, found that in some schools it was assumed that teachers would automatically know how to apply technology into lessons. He also found that schools that enrolled in focused ICT integration courses were more strongly associated with use of ICT in the classroom.

Betcher (2009) wrote about teacher processes of IWB use. He believed that before full adoption can take place the teacher goes through a three phase process.

Phase 1 – *Doing old things in old ways* – Here the new technology is not utilised at all. The board is mostly used as the old whiteboard/blackboard was used. A limited use of the toolset may occur and teacher doesn't take advantage of the inbuilt software capabilities, the interactive nature or indulge in the saving and collaborating facility.

Phase 2 – *Doing old things in new ways* – The teacher has a greater use of the saving facility and prepares lessons in advance. The teacher now uses the features of the IWB such as moveable objects and reduces workload through reuse and sharing of content.

Phase 3 – *Doing new things in new ways* – In this phase the teacher adds the multimedia capabilities to their teaching. Using online libraries and bringing the virtual world into the classroom. Here there are increased levels of interactivity. Delving deeper into the content thus enabling an understanding and allowing students to collaborate and interact with others outside the classroom.

Fullan & Hargreaves (1991) asserted that with the ever-changing nature of teaching and culture within schools the greatest problem is, knowing how to 'create sustain and motivate good teachers throughout their career'. They state that the key to this is *Interactive Professionalism*. 'Interactive professionalism involves redefining the role of teachers and the conditions in which they work'. They concluded that the result of all strategies adopted by schools must be '*new ways of thinking and acting that permeate the daily life of schools....where action in trying out new approaches is imperative*' (Fullan & Hargreaves, 1991, p.85).

Fullan & Hargreaves (1991) refer to Rosenholtz (1989) who observes the notion of collaboration in effective schools.

It is assumed that the improvement in teaching is collective rather than an individual enterprise and that analysis evaluation and experimentation in concert with colleagues are conditions under which teachers improve (Fullan & Hargreaves, 1991, p. 73).

Fullan and Hargreaves (1991) suggest that when teachers work collaboratively, sharing the responsibility and workload to further develop their teaching skills and resources this will ‘unleash energy and enthusiasm among teachers’ as they can then make the most of the collective expertise of all staff and improve the learning environment of their students.

It is individuals and small groups of teachers and heads who must create the school and professional culture they want (Fullan & Hargreaves, 1991, p.139).

2.9 Teacher Attitudes of IWBs

Good teaching remains good teaching with or without the technology; the technology might enhance the pedagogy only if the teachers and pupils engaged with it and understood its potential in such a way that the technology is not seen as an end in itself, but as another pedagogical means to achieve reaching learning goals (Higgins et al, 2007, p. 217).

Cuthell (2005) noted feedback from a mathematics teacher of a comprehensive school to provide evidence of IWB use on learners. The teacher found pupil interaction with board to improve learning and felt that student enthusiasm and participation levels increased.

In fact in some Year 7 lessons their eagerness to demonstrate their work and understanding to the rest of the class using the board has been quite overwhelming! (Cuthell, 2005, p.5)

Kennewell and Beauchamp (2007) found through interviews with teachers that IWBs were seen to gain students attention and retain it for longer.

They seem to be more interested in the lesson again because they’ve got pictures, visual, they’ve got things there to look at, they’ll stop and they’ll ask and answer questions because it’s there in front of them (Kennewell & Beauchamp, 2007, p.230).

Teachers felt the IWB increased pupil participation which was seen as particularly important for less able students. Teachers also remarked on how valuable the 'hands on' interaction with the board was and felt that all students were cognitively engaged in the same task. Regarding collaborative work, teachers remarked that they were sharing more than previously and felt that the new technology has increased their workload.

The INTO's InTouch magazine (Issue 82 Jan/Feb 2007, pp.47-51) shared a story on ICT integration. A teacher in school had completed masters which looked at the impact of IWB's. Findings out of 59 teachers surveyed:

- 69% expressed greater teacher enthusiasm
- 77% indicated improved quality of teaching
- 96% agreed that they increased pupils motivation
- 93% agreed pupils were enthusiastic about learning
- 94% believed Interactive Whiteboards make it easier to accommodate all learning styles.

This study also found that the location of the board is not crucial to the success of its use but that fixed installation in mainstream classes may represent the optimal choice, particularly when schools are making an initial investment. Teachers expressed some concerns with regard to technical aspects such as problems caused by shadows, excessive sunlight and lack of durability of pens. 90% of respondents believed that the introduction of the IWB has made it easier to incorporate ICT into everyday lessons with some respondents stating that they have never incorporated ICT into their teaching as much as they do now.

However, Cogill (2002) noted that prior experience in use of ICT is an important factor in order to use the IWB beyond just as a standard whiteboard. Factors affecting adoption include teacher's confidence, competence and beliefs along with attitudes to using ICT.

The implementation of ICT activities was primarily dependant on individual teacher initiatives. The enthusiastic ICT teacher demonstrated patience, a willingness to experiment and flexibility in their approach (Cogill, 2002, p.8)

Research has found that IWBs can give teachers greater control of the learning process and although this can enable the teacher to facilitate learning and encourage interactivity on the one hand, there are also those who have suggested (Smith 2001; Wood 2007) there may be a danger of teacher dominating lessons and teaching styles becoming more didactic in nature. Knight et al (2004) and Cogill (2003) found that IWB are not necessarily used interactively. They felt that without positive support such as continued professional development courses for teachers on use of IWB as an interactive teaching tool, teaching style could revert to a more teacher centered approach where teacher rather than child dominates the lessons.

2.10 Students Attitudes

Many studies (Levy, 2002; Becta, 2003; Hall & Higgins, 2004; Solvie, 2004) have noted motivation and increased student engagement as a benefit of using IWBs in classroom teaching. When children are actively involved and have a sense of ownership of their own learning they show higher levels of enjoyment and this motivates.

Prensky (2001) believes that today's students think and process information fundamentally differently to their predecessors. He refers to students today as 'digital natives' as they have grown up in the digital age, technology is part of their everyday lives from listening to music, playing computer games and using the internet, all information required is accessed through the touch of a button. He believes that teachers or 'digital immigrants' who haven't grown up in this age can struggle to teach these students. He suggests that confronting the issue would require a change in both the methodology and content, moving from a traditional teaching methodology to a digital and technological methodology with suggested content being interactive game based learning. Prensky parallels Betcher (2009) when he says that teachers must adopt a different approach to teaching and begin 'learning new ways to do old stuff' in other words the curriculum still remains but the method of delivery differs. It could be argued that this technological shift which is needed can be provided by IWB's as they provide an interactive learning approach to teaching the curriculum to today's primary school students or 'digital natives'

Ian Hall and Steve Higgins research study entitled '*Primary schools students perceptions of interactive whiteboards*', (2004) consisted of twelve group interviews with 72 students aged between 10 and 11 years of age. Overall they found the students to be generally positive about aspects of IWBs such as their multimedia capabilities and the fun element they bring to learning. Negative aspects highlighted included technical problems, teachers and students ICT skills and lack of access to technology, with students expressing a desire for more interaction with the board. This study was conducted when IWBs were in their infancy in the UK, a similar position of Irish schools today.

Focus group questions targeted what students liked about learning from IWB as opposed to normal whiteboard.

It's like better than the normal whiteboard because on the whiteboard all you can do is write and draw like boring pictures but on that one (IWB) you can do loads of different kinds of stuff and you can play games on it (School 7, Hall & Higgins, 2004, p. 106).

All students alluded to the multimedia aspect of IWBs in engaging and holding their attention. All of the pupils felt the IWB made lessons more enjoyable and fun (Levy 2002; BECTA, 2003).

Multimedia effectively creates a classroom without walls, bringing into the classroom examples of real life situations drawn from the students direct culture, perhaps a key factor in enhancing the child's learning from the Vygotskian perspective (Bransford et al, 2002; Gredler, 2004).

Beeland (2002) in his study found that pupils were most positive about the IWB lessons in which teachers made most use of their facility to present multimedia resources.

Negative aspects were mostly in relation to technical issues, such as, screen freezing, computer crashing and need to recalibrate. Other issues which caused frustration were difficulty in seeing the board, due to sunlight glare, display issues or height of board. BECTA (2004) found location of board to be crucial, in order for all to gain access. Smith (2001) also noted visibility issues due to incorrect height of board A few students noted the lack of ICT skills of some of their teachers and lack of access to the board as a negative aspect.

Everyone's really quite used to the whiteboard but we've got this teacher and well she's kind of new to whiteboards because she's a new teacher and I think she's still catching on to using the whiteboards and so are two other teachers (school 1).

Previous research (Beeland, 2002; Solvie, 2004) had similar findings with many students expressing an interest in increased physical access to the board.

“None of us get a go, it's like one every month” (school 10. Hall & Higgins, 2004, p.111)

2.11 Motivational Impact of IWBs

Intrinsic motivation refers to motivation that is driven by an interest or enjoyment in the task itself, and exists within the individual rather than relying on external pressures or a desire for reward. Students who are intrinsically motivated are more likely to engage in the task willingly as well as work to improve their skills, which will increase their capabilities (Wikipedia, 2013).

Many studies (Beeland, 2002; Smith et al, 2005; Kennewell & Beauchamp, 2007; Lewis, 2009; Mc Keown, 2010) have noted motivation and increased student engagement as a benefit of using IWBs in classroom teaching. When young children in the primary school are actively involved and have a sense of ownership of their own learning they show higher levels of enjoyment and therefore this increases motivation to learn.

The IWB is a novelty. Clutching a 'magic' pen and moving stuff around a giant screen is a novelty and this motivates (Lewis 2009 [online])

Many studies have alluded to the motivational impact of IWB technology. Clemens (2001) found enhanced performance from low achieving pupils when using IWBs. Weimer (2001) in his experimental design studied the connection between student attitudes and motivation and found clear benefits associated with IWB. (Smith et al., 2005) found that lessons using the IWB were found to capture and hold pupils attention more strongly than other classroom resources.

Beeland (2002) conducted an action research study on Interactive Whiteboards and Student engagement. His study assessed whether student engagement in the learning process was increased while using IWBs. This qualitative study involved collecting data from both teachers and students who used IWBs in daily lessons (10 teachers and 197 student participants in all). Research tools used included teacher and student questionnaire, student surveys and lesson observations. All data was measured and analysed for levels of student engagement. An advantage of IWBs was that they were seen to motivate pupils with resulting improvement in attention and behaviour. Results found that IWB use did lead to increased student engagement primarily due to the 'visual aspects' of using the whiteboard. Although he found both teachers and students were positive about the technology it was felt that further studies were needed to assess whether the associated motivation was linked to increased learning.

A study by Wood and Ashfield (2007) on student teachers found the level of interaction was connected to the skill and professional knowledge of the teacher. The study found that although the IWB may alter the way learning takes place and heighten motivation it may have no measurable impact on student achievement.

2.12 Barriers to IWB implementation

Cuthell (2005) noted that despite many government policy initiatives in the UK for IWB implementation in schools the transformation can be a slow process. Schools adapt to new technologies at different rates.

Changing the course of teachers and schools is in many ways is similar to changing the course of a super tanker. It takes a long time before anything appears to happen (Cuthell, 2005 p.1).

All studies have found barriers to implementation and there are many parallels including insufficient training, technical issues, teacher and student ICT skills and access to technology. As with all new teaching tools, technology or otherwise training and support are essential in order to implement it into teaching and learning. Technical support was a major theme along with adequate teacher training (Becta, 2004; Levy 2002; Beeland, 2002; Hall & Higgins 2004; Kennewell & Higgins, 2007). Becta (2004) recommended whole school training and felt that teachers needed reassurance regarding technical support.

Irrespective of the gains that may be achieved from the technology, such mitigating issues can result in teachers losing confidence and any perceived benefits are then lost.

However, in only a small proportion of schools are whiteboards being used to their full effect. In many schools too few staff, have had sufficient training to gain confidence in their use or to take any imaginative steps in using the technology to meet the special needs of their pupils (Hall & Higgins, 2005).

Recommendations from Department of Education (2007) *Investing Effectively in Information and Communication Technology in Schools 2008-2013* included provision of training and technical support. They recommended that schools should have ‘a functional and dependable ICT infrastructure’ and training and professional development should ensure that schools can ‘transform into eLearning environments’.

In order for successful implementation the report states that ‘cohesion’ and ‘co-operation’ between all educational partners is needed to support the move towards embedding this eLearning culture. The report recommended that an ICT policy unit coordinate the cross agency co-operation for ICT integration. The NCTE will formally implement the Departments ICT in Education policy. Increased collaboration between NCTE and other Government agencies and school support initiatives will be facilitated. NCTE must provide a wide range of advice, guidance and support to schools and in particular school principals and ICT co-ordinating teachers. They also recommended that existing dialogue and collaboration with relevant industries be built upon in order to bring tangible supports to the ICT in schools initiative (Department of Education, 2007, p. 25).

2.13 Conclusion

The literature review has explored the background to Information and Communications Technology in Irish Education over the past thirty years. It focused in particular on Government strategies, policies and funding in the area and how this in turn impacted on ICT in the primary curriculum. It found that initial attempts to integrate ICT into curriculum and learning had been less than successful. It also found that there has been a widespread adoption of IWB’s globally in Education and in particular in the UK since 2000.

Therefore much of the research used in the review is UK based. In more recent years Irish Education has seen an upsurge in IWB use which has come as a consequence of many government initiatives to improve ICT use in education, in particular the most recent government report *'Investing Effectively in Information and Communication Technology in Schools 2008-2013'*.

The review also explores the potential of IWB's in teaching and learning, looking at implications it may have for both the teacher and learner. It highlights studies (Becta, 2004; Levy 2002; Beeland, 2002; Hall & Higgins 2004; Kennewell & Higgins, 2007, Intouch, 2007) where teachers have expressed their opinions on the benefits and drawbacks of using the whiteboard in the classroom setting. Studies from (Cuthell, 2005; Kennewell & Beauchamp, 2007) on using IWB's in Education showed that teachers were generally positive about the technology. They highlighted many benefits for both the teacher and learner including increased levels of pupil motivation, accommodation of different learning styles and ease of incorporation of ICT into the curriculum. The research revealed that although it is quite a user friendly technology training and technical support are essential for full integration. Lack of sufficient training was noted as a drawback by teachers and many expressed a need for further training. It was noted that changes in both methodology and content need to occur to use the IWB effectively and this process takes time. It has been suggested that collaboration within schools is key to making this change (Fullan & Hargreaves, 1991). Studies (Hall & Higgins 2004; Beeland, 2002; Becta, 2003) on student attitudes mirrored that of teachers regarding student motivation and engagement with many expressing that learning from the IWB was an enjoyable learning experience. Students in particular enjoyed the interactive and multimedia aspects of the boards. Regarding drawbacks students also noted that technical problems were common and some expressed a desire to access the board more frequently. It could be argued that the fact that children today have grown up in the technological era using technology in their everyday lives that the IWB can help provide the shift which was required in Education.

Chapter 3

Methodology

3.1 Introduction

This chapter presents the research methodology used in this study. It explains the purpose and structure of the research study and describes research questions giving reasons for chosen research methodology data collection tools.

3.2 Approaches to Educational Research

There are many approaches to educational research. All come under the umbrellas of naturalistic, qualitative, ethnographic, historical and documentary research. This section discusses some of the main methods used in educational research.

3.2.1 Case studies

A case study is one type of naturalistic enquiry and can be defined as an investigation into a specific instance or phenomenon in its real life context (Arsenault and Anderson, 1998). Case studies recognise that there can be many variables in any one case therefore they usually require more than one data collection tool. They can mix qualitative and quantitative data therefore a mixed method approach to data collection is common. Case studies can explain, describe, illustrate and enlighten (Yin, 2009: 19-20).

3.2.2 Action Research

Action research is a popular way of allowing educational practitioners to research their own institutions or practice in order to bring about change. There are many different conceptions of action research, Kemmes and McTaggart (1988) attempted to encompass all in this definition;

Action research is a form of collective self-reflective enquiry undertaken by participants in social situations in order to improve the rationality and justice of their own social or educational practices as well as their understanding of these practices and the situations in which these practices are carried out. ...The approach is only action research when it is collaborative, though it is important to realise that the action research of the group is achieved through the critical examined action of individual group members (Kemmes and Mc Taggart, 1988:5, cited in Cohen & Manion, 2011 p. 346).

3.2.3 Ethnographic Research

Ethnographic studies represent another approach to the study of social behaviour. This type of research endeavours to view situations through the eyes of the participants. Accounts are widely used in ethnographic research. They serve to explain our past, present and future orientated actions.

The importance of the meaning of events and actions to those who are involved in them is now generally recognised in social research (Cohen & Manion, 2011 p. 453).

3.2.4 Observational Research

The distinctive feature of observation as a research process is that it offers an investigator the opportunity to gather 'live' data from naturally occurring social situations (Cohen & Manion, 2011, p. 456). Observational research allows the researcher to look afresh at everyday behaviour that otherwise might be taken for granted, expected or go unnoticed (Cooper and Schindler, 2001:347).

3.2.5 Comparative Research

A comparative investigation can be used to study groups which are similar and which have the same experience with the exception of one condition and here the effect of the one differing condition on the dependant variable can be assessed (Cohen, Manion and Morrison 2011). In order for it to be a true experiment or fair test there must be stringent controls.

3.2.6 Research Method in this Study

This research study was labelled a comparative case study in that it endeavoured to measure the effectiveness of Interactive Whiteboards (IWBs) as primary school teaching and learning tools as opposed to traditional teaching methods. It also strove to highlight the views of the research participants regarding the IWBs motivational impact along with the perceived benefits and drawbacks of its use in the primary setting. As with all case studies the results of this study will fit the context and therefore cannot be generalised for other primary settings. This study had a mixed method approach to data collection using qualitative and quantitative methods of data collection in order to answer the research questions.

3.3 Purpose of Research

The purpose of this research study was primarily to investigate if a link exists between Interactive Whiteboard use and increased student motivation for learning. The researcher attempted to compare and identify any learning benefits of Interactive Whiteboard use as opposed to learning from traditional teaching methods and to identify the attitudes of the research participants, namely, primary school teachers and students regarding IWB as teaching and learning tools.

The research study was conducted over a two month period from March 2013 to May 2013.

3.4 Research Setting

The research setting is Primary schools in North Tipperary. Data was gathered from thirty Primary school teachers from fifteen rural primary schools in North Tipperary. Two of the primary schools also had student participants. All of the participating schools have Interactive Whiteboards in every classroom.

The experimental student group was from the researchers own school, a rural four teacher primary school and a neighbouring primary school provided the student control group. The researchers own school has a more traditional background and teaching approach. However over the last three years they have been investing in Information and Communications

Technology (ICT) within the school, with all classrooms receiving an IWB. Prior to this each classroom had one computer for student and teacher use. The IWBs have been integrated into the current teaching methodology at varying levels within the school, some teachers more progressive than others and some more confident in using ICT to teach the curriculum.

3.4.1 Research Participants

In total there were thirty primary school teacher participants from fifteen different primary schools in North Tipperary and one hundred and twenty primary school student participants from two primary schools in North Tipperary. Thirty primary school teachers completed a teacher attitude of IWB questionnaire, 6 of which also participated in a focus group interview and one primary school teaching principal participated in an interview. Of the 120 student participants, 54 participated in the lesson and testing section, two groups of 27 students which made up the experimental and control groups for lesson, while 75 students from third to sixth class were involved in the student attitude survey and all 93 students were involved in classroom observations of IWB use. The sample size was sufficient to allow for statistical analysis of results.

A sample size of thirty is held by many to be the minimum number of cases if researchers plan to use some form of statistical analysis on their data (Cohen, Mannion, and Morrison, 2001, p.231).

Data Collection Tool	Time Frame	Number of Participants
Teacher Questionnaire	4 th March – 26 th April 2013	30
Focus Group Interview	1 st May 2013	6
Principal Interview	15 th April 2013	1
Testing (2 Groups) Experimental and Control Group	6 th – 14 th March	54 27 each group
Student Survey	18 th – 22 nd March	75
Observations	18 th March – 8 th April	93

Table 3.1 Breakdown of participants for data collection tools.

3.4.1.1-Student Participant Selection criteria

There were a total of 120 student participants ranging in age from 5 – 12 years. Seventy five students from 3rd to 6th classes participated in the student attitude survey. Fifty four students from 4th class (2 groups of 27) participated in the lesson content and testing data collection while ninety three children from all class levels (Junior Infants -6th class) in primary school were involved in the classroom observations.

3.4.1.2-Adult participant criteria

In all, fifteen rural primary schools in North Tipperary were approached to participate in the teacher attitudes to IWB's questionnaire (Appendix E). A total of 30 primary school teachers completed an online questionnaire. All participating schools had IWBs installed in their classrooms.

Six teachers from one school participated in a follow up focus group interview (Appendix J) and one teaching principal participated in an interview.

3.5 Research Questions

In order to decide on which research method and data collection tools to use for this study one must look at the research questions:

1. Are IWBs effective teaching and learning tools in Primary Schools?
2. Does the IWB have any effect on student motivation to learn?
3. What do primary school teachers and students perceive to be the benefits and drawbacks of using the IWB in the classroom?

3.6 Research Methodology

3.6.1 Quantitative and Qualitative Studies

Quantitative Research refers to the systematic empirical investigation of social phenomena via statistical, mathematical or computational techniques. The process of measurement is central to quantitative research because it provides the fundamental connection between empirical observation and mathematical expression of quantitative relationships (Given, 2008) [online]

This type of research gives rise to facts therefore resulting in quantitative conclusions (Bell, 2005, p.7).

Qualitative Research is a multi-method in focus, involving interpretative, naturalistic approach to its subject matter. This means that qualitative researchers study things in their natural settings, attempting to make sense of or interpret phenomena in terms of the meanings people bring to them (Denzin & Lincoln 2004, p.2).

This type of research looks at insights of the world rather than the statistical perception (Bell 2005, p.7).

For this research study, it was felt that both methods would prove beneficial. Quantitative data collection tools such as testing and questionnaires to research the effectiveness of the IWB as a teaching and learning tool. When delving into the motivational aspect of the IWBs as well as the attitudes of its users namely students and teachers, qualitative data tools; observations and interviews were used.

3.6.2 Comparative Case Study

In this study in order to answer the question ‘Are IWBs effective teaching and learning tools in Primary schools?’ a comparative case study using both quantitative and qualitative data collection tools was decided on. In order to maintain consistency two mixed ability groups of the same number (27) and age (10-11 years) were selected to take part in the lesson content and testing section. The same teaching style was used to deliver content; a geography lesson on European countries through two different mediums, a traditional delivery to the control group using traditional methods of blackboard and hard copy while the experimental group

were exposed to identical lesson content from the IWB. Both groups were also exposed to the content for same amount of time, each received a one hour lesson.

Both groups participated in a pre-test before lesson exposure and there followed a post-test to assess learning (Appendix G).

3.7 Research Collection Tools

The researcher decided on the following data collection tools to best answer the research questions:

Research Area	Timeframe	Data Collection Tools
IWB as a teaching and learning tool	6 th – 14 th March 2013	Testing
Motivational factor	18 th March – 8 th April 2013	Observations Student Survey
Perceived benefits/drawbacks of IWB's	4 th March – 1 st May 2013	Teachers Questionnaire Focus Group Interview Principal Interview

Table 3.2 Data collection tools used for research areas

In order to ascertain which data collection tools to use to best answer the research questions the researcher considered different models of research outlined by Cohen, Manion and Morrison 2011 p.128. Morrison (1993) found it useful to consider the features of each model in order to gain conceptual clarity when choosing research tools. In order to ensure reliability and validity a multi-method approach was decided on using the following data collection tools.

The testing of both experimental and control groups allowed the researcher to both compare the learning and assess the effectiveness of the IWB as teaching and learning tool although this has limitations as outlined below. The student survey, the teacher questionnaire, classroom observations along with teacher and principal interviews were used to further

explore the views of the research subjects regarding IWB effectiveness. The researcher also used these tools to explore the motivational impact of the IWB thus satisfying triangulation.

3.8 Theory and Development of Data Collection Tools

3.8.1 Testing

The construction and administration of tests is an essential part of the investigative model of research (Cohen et al 2011). Formative testing is undertaken during a programme and is designed to monitor student's progress during that programme, to measure achievement and to diagnose strengths and weaknesses.

Advice was sought from the researchers teaching peers before designing content and tests for research subjects. The researcher wanted to ensure that the content and tests were pitched at an appropriate level for student understanding and also to ensure reliability of test as a research tool.

Both the experimental and control groups received identical content delivered through a different medium. The content was delivered to both groups on the same day and given the same timeframe (1 hour). Both teachers were given an identical lesson plan to follow (Appendices H& I). Both groups participated in identical pre and post-tests within the same timeframe. All tests were marked by the researcher. The tests were designed to assess prior knowledge and knowledge gained as a result of lesson, thus measuring achievement and effectiveness of teaching tool.

3.8.2 Questionnaire and Survey

The questionnaire is a widely used and useful instrument for collecting survey information, providing structured, often numerical data, being able to be administered without the presence of the researcher and often being comparatively straight forward to analyse (Wilson and McLean, 1994, cited in Cohen et al, 2011 p.377)

Youngman (cited in Bell 2005, p.137) lists seven types of questions that can be used in a questionnaire. Verbal or Open questions have a word, phrase or extended comment. List questions where participants can choose responses from a list. Category questions when the participant can only chose one answer from the chosen category. Ranking questions where participant places their response in order. Quantity style questions to choose a number as response. Grid and tables are used to record answers and can provide researcher with two or more answers at the same time. Scale questions discover the strength of attitude of the participants. An example of a common scale is the Likert Scale which asks respondents to indicate strength of agreement or disagreement within a given statement or a series of statements generally on a five or seven point range Likert (1932 cited in Bell 2005, p.219).

In all ten schools were contacted to participate in the teacher questionnaire ‘Teacher attitudes to IWB’s. Kwiksurveys.com was used to create an online teacher questionnaire for this research study. It offered a good selection of templates based on list, category, scale and ranking questions (Appendix E). Open questions were excluded from the questionnaire and left to the follow up focus group interview with teachers.

The questionnaire was chosen as a means of access to a large group of Primary teachers in order to collect data regarding their attitudes to and use of IWBs and thus aid in answering the research study questions.

3.8.3Interviews

The interviews in this study were semi- structured in nature which allowed for flexibility while also allowing the researcher control the direction. The research interview has been defined as ‘a two person conversation initiated by the interviewer for the specific purpose of obtaining specific research- relevant information and focused by him on content specified by research objectives of systematic description, reduction and explanation (Connell and Kahn, 1968). The interviews in this study were semi-structured in nature allowing for flexibility regarding flow of interview while controlling the direction.

Although the interview as a data collection tool has some drawbacks regarding time and reliability it also has many advantages by providing access to opinions, knowledge attitudes

and beliefs and allowing for greater depth than is the case for other methods of data collection tool (Kerling 1970).

Another interview method is the focus group interview; here views of a number of participants can be sought in a less formal sense.

Such interviews are useful... where a group of people have been working together for some time or common purpose, or where it is seen as important that everyone concerned is aware what others in the group are saying (Watts and Ebbutt, 1987).

Interviews for this study were recorded, the focus group interview was taped and transcript can be found in the appendix (Appendix J). Notes were taken during the interview with the principal and suitable references used in the study.

3.8.3.1 Principal Interview

An interview was conducted with the principal of a primary school who had made the decision to install IWBs in every classroom in recent years. The researcher thought it would be beneficial to the study to explore the principal's views on IWBs and on their choice of teaching tools for the whole school.

The interview with the principal of Primary school was semi-structured in nature. The researcher had a set of pre-prepared questions in order to ensure that research objectives were addressed. However the semi-structured nature allowed the researcher to be more flexible in their approach both with the questions and the direction of the interview, thus allowing the researcher to respond to information which arose during the interview.

3.8.3.2 Focus Group Interview

The focus group interview was chosen to validate another tool, the teacher questionnaire. Overall thirty primary teachers completed questionnaires, the follow-up focus group interview with six primary teachers allowed the researcher to further explore and delve deeper into issues highlighted by the questionnaire as well as elaborate on existing data (Appendix J).

The researcher decided to hold the focus group interview shortly after the teacher questionnaire submission to ensure reliability and validity of both instruments. The interview was held in a participating primary school in North Tipperary. The focus group interview lasted two hours and provided an opportunity for participants to discuss issues in a controlled environment. The researcher took on the role of facilitator, keeping control of the direction of the conversation yet giving the respondents a certain amount of freedom to express their views. Again the approach to the focus group interview was a semi-structured one. Questions and statements were prepared in advance of the meeting but the researcher wanted to allow the research subjects the freedom to explore issues which arose during the focus group meeting and to change direction if necessary. Thus allowing the researcher access to more information and to delve deeper into issues which arose from the questionnaire or within the meeting itself. The interview was recorded and a transcript can be found in the appendix.

3.8.4 Observations

Morrison (1993:88) argues that being immersed in a particular context over time not only will the salient features of the situation emerge and present themselves but a more holistic view will be gathered of the interrelationship of 'factors'.

Observations are recorded in field notes. These can be written at several levels, one level is a descriptive level, describing events, behaviour and activities.

Observational data can be collected in a structured, semi-structured or unstructured way. A structured observation will know in advance what it is looking for. A semi-structured observation will have an agenda of issues but will gather data to illuminate these issues in a less pre-determined systematic manner. An unstructured observation will be far less clear on what it is looking for and therefore may have to observe what is taking place first before deciding on its significance for the research (Cohen & Manion & Morrison, 2011, p.458)

Semi-structured classroom observations of participants were conducted as part of this study. The researcher wanted to observe the children in situ, while being taught content on the IWB. In order to ensure that researcher's presence during classroom observations didn't impact on student behaviour, the researcher chose to conduct observations in classrooms known to

them. The researcher chose to observe in classrooms where they previously worked in a learning support role with groups of students. Therefore causing the minimum of disruption and interaction with the participants who were largely unaware they were being observed. The researcher took field notes, documenting anything they felt was relevant, which related to research questions. For example notes taken of instances in the classroom where children were actively involved in the lessons, how they engaged with the lesson, evidence of motivation and interaction with the board (Appendix K).

3.8.5 Piloting of Research Tools

A pilot study was conducted in January, two months prior to project start on all research tools to ensure that each instrument was appropriate for use. The data collection tools concerning adult participants were piloted on a colleague of the researcher. While the instruments for use with children; tests and student survey were piloted on the researcher’s daughter who is of a similar age and background to the research study group. The designed tests were also piloted on a small group of students external to the research study participants. They were asked for feedback on clarity of items and questions presented in test and on instructions, readability and general layout. No changes were necessary before distribution to research subjects.

3.8.6 Research Timeline

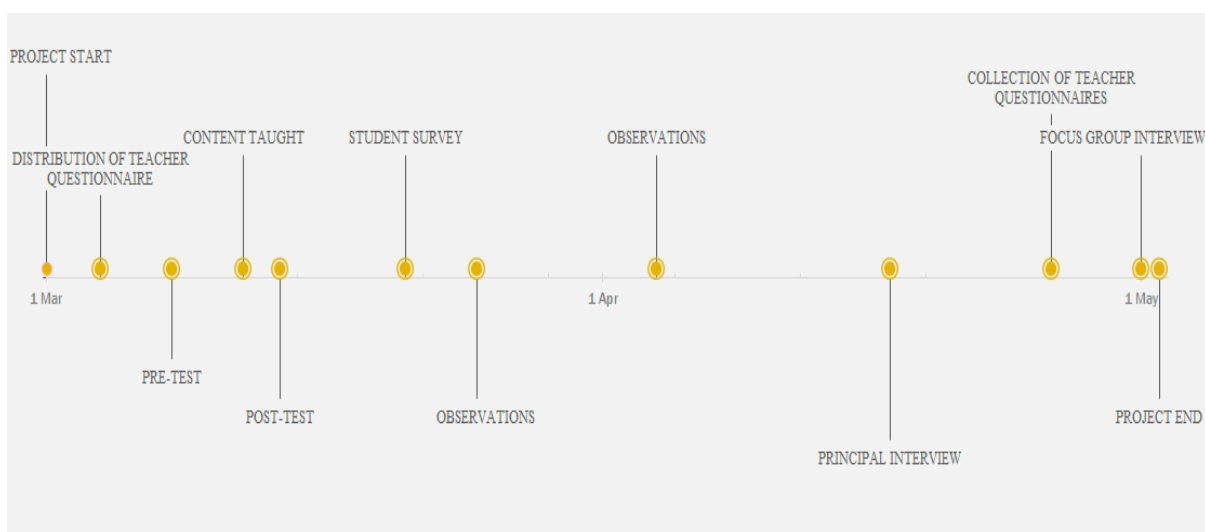


Figure 3.1 Research Timeline

The research project began in early March 2013 with the distribution of letters of notification to staff, board of management and parents regarding the research study (Appendices A-D). Once permissions were granted letters and emails were sent to four schools in North Tipperary asking them to participate in the Teacher Attitude to Interactive Whiteboard Questionnaire (Appendix B). During week beginning 4th March 2013 both control and experimental groups sat the pre-test followed by the lesson content. The following week the students sat the post test (Appendix G). During the week beginning 18th March 2013 students participated in the student attitude to IWB survey (Appendix F) and classroom observations of 3rd – 6th classes were conducted (Appendix K). There followed a two week Easter break. Following the Easter break further classroom observations of the junior classes (Junior Infants to 2nd class) were held. Response rate from teacher survey was low and decision was made to send reminders to schools and a further eleven schools were contacted to participate in the teacher questionnaire. An interview with the primary school principal was held on 15th April 2013. Final date for submission of teacher questionnaire was Friday April 25th 2013. Research project concluded with a focus group interview with six primary teachers on Wednesday 1st May 2013.

3.9 Data Analysis Considerations

This section contains information on triangulation, reliability, validity and ethics to consider for data analysis.

3.9.1 Triangulation

Triangulation may be defined as the use of two or more methods of data collection in the study of some aspect of human behaviour (Cohen & Manion & Morrison, 2011, p.195)

Triangulation techniques in the social sciences attempt to map out or explain more fully the richness and complexity of human behaviour by studying it from more than one stand point and in doing so by making use of both quantitative and qualitative data. It is a powerful way of demonstrating concurrent validity, particularly in qualitative research (Campbell and Fiske, 1959).

In this study a mixed method approach was decided upon to ensure triangulation. To confirm and strengthen data findings from one method which is corresponded in other methods.

Exclusive reliance on one method may bias or distort the researcher's picture of the particular slice of reality. When outcomes of one method of data collection correspond to those of another the researcher will be confident about findings (Cohen & Manion & Morrison, 2011, p.195).

Data collection tools of tests, student survey, the teacher questionnaire, classroom observations along with teacher and principal interviews were used to assess effectiveness of the IWB as a teaching and learning tool and furthermore to explore the views of the research subjects. The researcher also used these tools to explore the motivational impact of the IWB thus satisfying triangulation.

3.9.2 Reliability and Validity

In this study the researcher was responsible for the correction of all tests and collection of data. All participant responses were reported truthfully in findings chapter 4.

For research to be reliable it must demonstrate that if it were to be carried out on a similar group of respondents in a similar context, then similar results would be found (Cohen et al, 2011, p 199).

Therefore the researcher decided to hold the focus group interview shortly after questionnaire submission to ensure both reliability and validity of instruments. The researcher endeavoured to use appropriate data retrieval instruments in order to answer the research questions.

Piloting all data tools ensured they were at appropriate levels and lacked ambiguity regarding question readability and instructions etc. By using the same pre and post tests and marking scheme for both control and experimental groups it enabled comparison as well as validation.

Both quantitative and qualitative methods can address internal validity. Internal validity seeks to demonstrate that the explanation of an event, issue or set of data which a piece of research provides can actually be sustained by the data. The findings must describe accurately the phenomena being researched (Cohen et al, 2011, p.183).

Research tools used in this study satisfied internal validity. Both quantitative tools (questionnaires, tests) and qualitative tools (interviews and observations) were valid instruments to measure the effectiveness of the IWB. All data tools used were successful in data measurement and description of events within the case study.

3.9.3 Ethics

Cavan (1977) described ethics as ‘a matter of principled sensitivity to the rights of others’ and that ‘while the truth is good, respect for human dignity is better’ (Cavan, 1977:810 cited in Cohen et al, 2011, p.84).

Frankfort – Nachiamias and Nachmius (1992) underline the need for confidentiality of participant identities. Therefore information provided by all participants should in no way reveal their identity. This was a consideration in this study and all tools (questionnaires, surveys interviews/tests and observations) all names were omitted and substituted with aliases. All ethical procedures were adhered to, permissions were sought to conduct the study from relevant authority (Board of Management and Principal and parents – see appendix).

With regard to the teacher’s questionnaire, a letter of explanation was sent to schools along with the link to questionnaire. All participants were assured of anonymity and sensitivity with regard to data handling.

3.9.4 Research Limitations

As this was a case study one does not have the ability to generalise findings for other primary school contexts. Another limitation in this study was the response rate to the questionnaire from primary teachers. The researcher had initially targeted four local primary schools which if all teachers participated would have given 30 participants for the teacher questionnaire. However, the response rate was very poor and only teachers that she had direct dealing with responded. Although additional reminders were sent to schools the response continued to be low. Therefore the researcher decided to widen the pool and invite other schools from the north Tipperary region to participate. In all although fifteen primary schools were contacted the final number of respondents was thirty.

Denscombe (2009:282) notes that online surveys tend to have lower item response than paper based surveys, that there may be many more dropouts before reaching the end of an online survey than in a paper based survey. Some other explanations for poor response from online surveys are

- Refusal to participate
- Survey/questionnaire not reaching intended people
- Unavailability
- Schools/teachers not wishing to be identifiable even with protections guaranteed.
- Schools suffering from too much research by outsiders and insiders.

(Cohen & Manion, 2011, p.394)

As this is a case study the findings of this study will be particular to the individual setting and therefore cannot be generalised for other primary schools. Another limitation was the differing sample sizes used for data collection. Different students were used to collect attitudes and observations. The student survey was completed by seventy five students and forty eight of those students along with a further seventy two students participated in observations. A further limitation could be bias within schools towards IWB's.

Chapter 4

Findings

4.1 Introduction

This chapter examines the findings from the comparative case study into Interactive Whiteboards as effective motivational learning tools in the primary classroom. It is divided into three main sections based on the three research questions outlined in chapter three. Data was collected from student testing, student survey, classroom observations, teacher questionnaire, focus group interview and principal interview. The data collection methods facilitated triangulation and aided the validity and reliability of the research study.

Section One

This section presents the findings of the data collected in researching the effectiveness of IWBs as a teaching and learning tool as opposed to traditional teaching methods in the primary setting and documents student results from testing.

Section two

This section presents the findings of the data collected in researching the motivational impact of the IWB on student learning. It presents findings from teacher questionnaire, student survey, classroom observations, principal interview and focus group interviews.

Section Three

This section presents findings of data collected from students and teachers concerning attitudes of IWBs, the perceived benefits and drawbacks for use in the primary classroom. Findings from teacher's questionnaire and interviews along with student survey are presented here.

4.2 Section 1

4.2.1 Profile of student participants

Testing and lesson delivery was carried out on two similar groups for this research study. Criteria for grouping included an equal number, similar age and learning ability. The study contained two fourth class groupings of 27 children ranging in age from 10-11 years with similar learning abilities. Both groups were matched as evenly as possible before testing. Their learning ability was ascertained through diagnostic testing and teacher observation.

4.3 Testing Structure

A pre-test was carried out with two groups containing 27 students; a control group and an experimental group prior to lesson content delivery. This was to assess the children's current knowledge of subject matter. It was then followed by lesson delivery. The same teaching style was used to deliver content; a geography lesson on European countries through two different mediums, a traditional delivery to the control group using traditional methods of blackboard and hard copy while the experimental group were exposed to identical lesson content from the IWB. A post-test was conducted a week later to assess learning.

4.3.1 Pre and Post Testing of Control Group

A control group of 27 students participated in a pre- test to assess current knowledge of the subject content this was followed by lesson delivery in a traditional manner. Participants then sat a post-test to asses any learning achieved. A comparison of the pre and post-tests results is illustrated in figure 4.1 below.

Control Group Pre & Post Comparisons

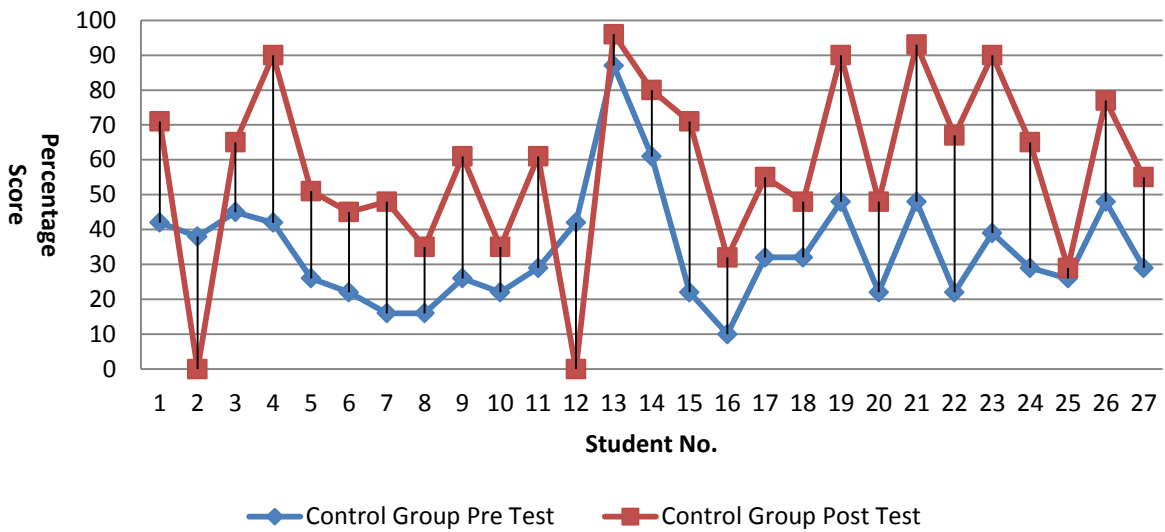


Figure 4.1: Control Group Test Comparison

Figure 4.1 illustrates that during the study 25 of the control group students (93%) improved their score following the post-test therefore concluding that overall learning was increased after lesson delivery. It must be noted that the two students which showed a decrease in score (Students 2 and 12) were absent from the post test.

4.3.2 Pre and Post Testing of Experimental Group

An experimental group of 27 students participated in a pre- test to assess current knowledge of the subject content this was followed by lesson delivery from an IWB. Participants then sat a post-test to asses any learning achieved. A comparison of the pre and post-tests results is illustrated in figure 4.2 below

Experimental Group Pre & Post Comparisons

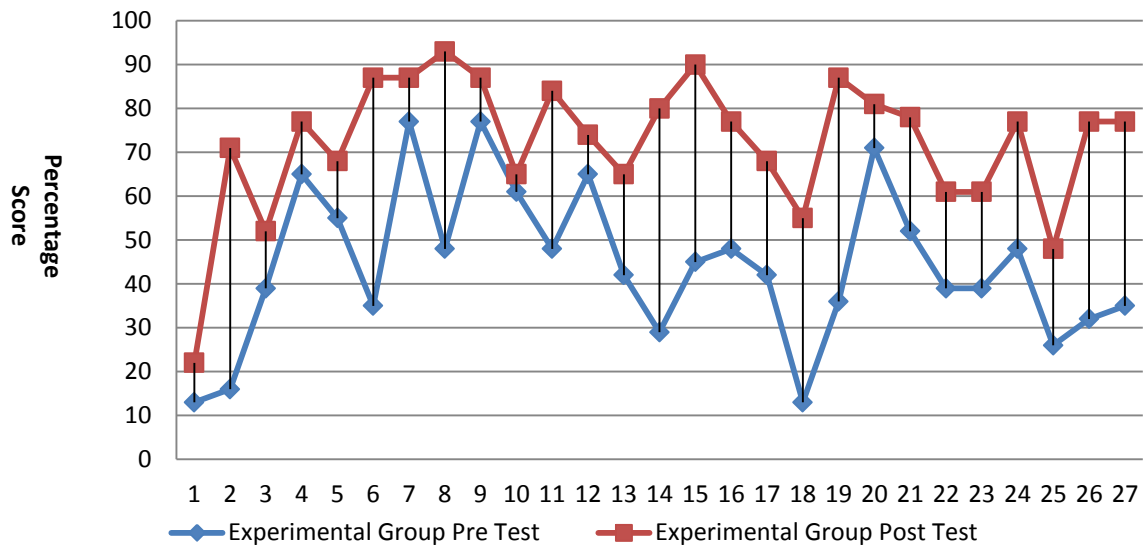


Figure 4.2: Experimental Group Test Comparison

Figure 4.2 illustrates that during the study all 27 of the experimental group students (100%) improved their score following the post-test therefore concluding that overall learning was increased after lesson delivery.

On comparing the percentage increase in test results of both control and experimental groups the average increase of the control group was @ 27% while the average increase of the experimental group was @28% indicating only a slight difference between the groups of 1%. Figure 4.3 in appendix shows the experimental group trending slightly above the control group.

Table 4.1 (Appendix) illustrates the findings from pre and post-testing of control and experimental groups and indicates the percentage increases achieved by each student. The abbreviations CG and EG are used to represent Control group and Experimental group.

4.4 Section 2

4.4.1 Motivational Impact of the IWB

In order to assess motivational impact of the IWB as a teaching and learning tool, semi-structured classroom observations (Appendix K) of participants were conducted as part of this study. The researcher wanted to observe the children in situ, while being taught content on the IWB. The researcher took field notes, documenting anything they felt was relevant and which related to research questions. The researcher conducted observations of ninety three primary school students from junior infants to sixth classes ranging in age from five to twelve years being taught by the IWB the researcher observed the following:

- High levels of interest and enjoyment from all the children, in particular the junior end of the school.
- The children wanted to interact with the board and were fully engaged with the lesson most of the time.
- At the lower end of the school (junior infants to third class), engagement was very high with 100% of children having their hands up to participate or become involved at every opportunity.
- Levels of disappointment from children who did not ‘get a go’ were palpable.

These finding also correspond with views of teachers. Thirty primary school teachers from North Tipperary participated in an online teacher questionnaire entitled ‘Teacher Attitudes to IWB’s (Appendix E).

Ranked Benefits of IWB's (Teacher Responses)

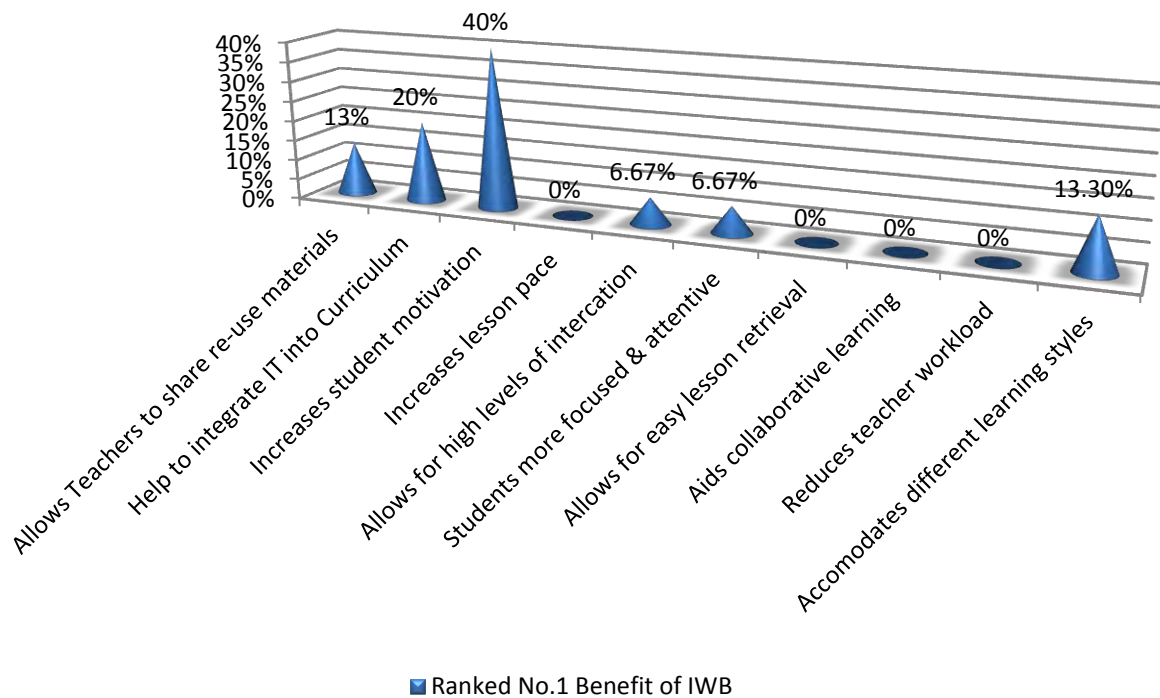


Figure 4.4: Ranked Benefits of IWB's

Teachers were asked to rank ten advantages of using IWB's in order of importance, with one being most important and ten being the least important. Results of questionnaire found that 40% of teacher respondents ranked 'increases student motivation' as number one benefit of using IWBs with a further 6.7 % of respondents ranking 'children are more focused and attentive' as number one.

The questionnaire also asked teachers to rate statements about Interactive Whiteboards on a scale from strongly agree to strongly disagree based on their experience of using them.

IWB's help to increase attention & motivation in students

Strongly Agree Agree Neutral Disagree Strongly Disagree

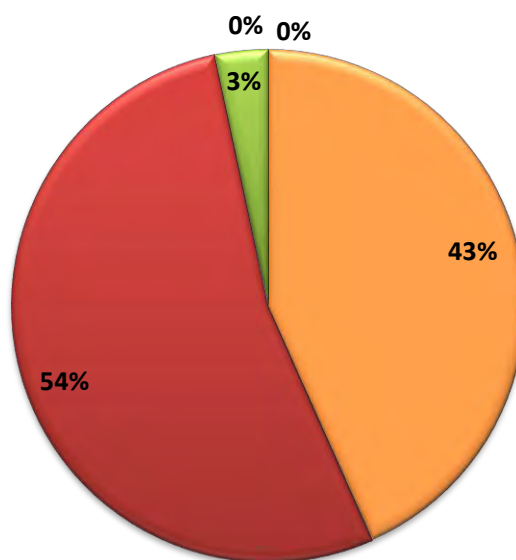


Figure 4.5: Teacher Response to Students Increased Attention and Motivation

In response to the statement 'IWB's help to increase attention and motivation in students' their response was overwhelmingly positive with 96.7 % of teacher participants in agreement. The focus group interview with six primary teachers also discussed the motivational aspect of IWB's. When posed with the question "Do you think the IWB motivates?" Responses from teachers were all positive; "Very motivated. I see when I come in for Maths lessons. They are mad to go to the board. Using the pen to make a set or just draw something". Other teachers agreed, with one responding "Yes and they absolutely love it. They love testing themselves on it and trying to beat previous scores". Teacher of the junior classes remarked on how the interactive nature engaged the students "Yeah, any little thing; even changing the colour of the pen, they all perk up to it!" In the focus group interview when drawn on the view that only the child using the board was focused on lesson teachers disagreed with the infant teacher adding "they all feel it's a group effort assisting the one at the board and watching. In English we were doing connecting words such as can and not and all of them were still calling out and being part of the lesson not just the child at the board. They were coming up with other words like on and to and so on to assist the child at the board".

IWB's make learning fun (Teacher Response)

Strongly Agree Agree Neutral Disagree Strongly Disagree

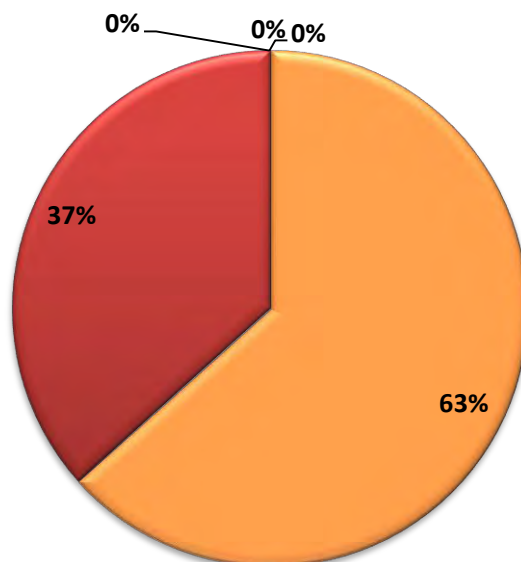


Figure 4.6: Teacher Response to IWB's Making Learning Fun

In response to the statement 'IWB's make learning fun' all teacher respondents of the questionnaire were 100% positive with all respondents in agreement. Seventy five students from two primary schools in North Tipperary completed the student survey 'Student Attitudes to IWB's' (Appendix F) in which an identical statement was posed. Figure 4.7 shows their responses. The student perspective was also positive and had similar findings with 90.5% of students in agreement that IWB's make learning fun.

IWB's make learning fun (Student Response)

■ Strongly Agree
 ■ Agree
 ■ Don't Know
 ■ Disagree
 ■ Strongly Disagree

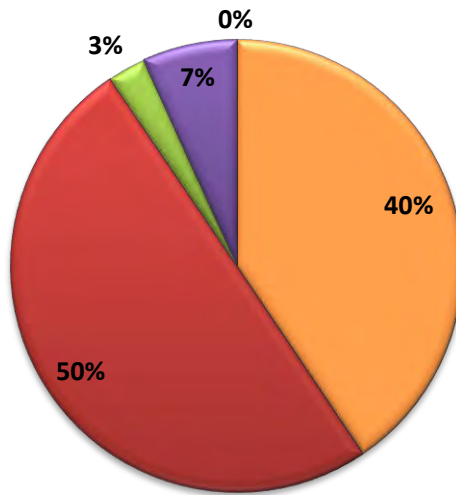


Figure 4.7: Student Response to IWB Making Learning Fun

Figure 4.8 below shows student responses to the statement ‘The IWB makes lessons more interesting’. From the 75 student respondents, the majority of students were positive with 61 students agreeing with the statement.

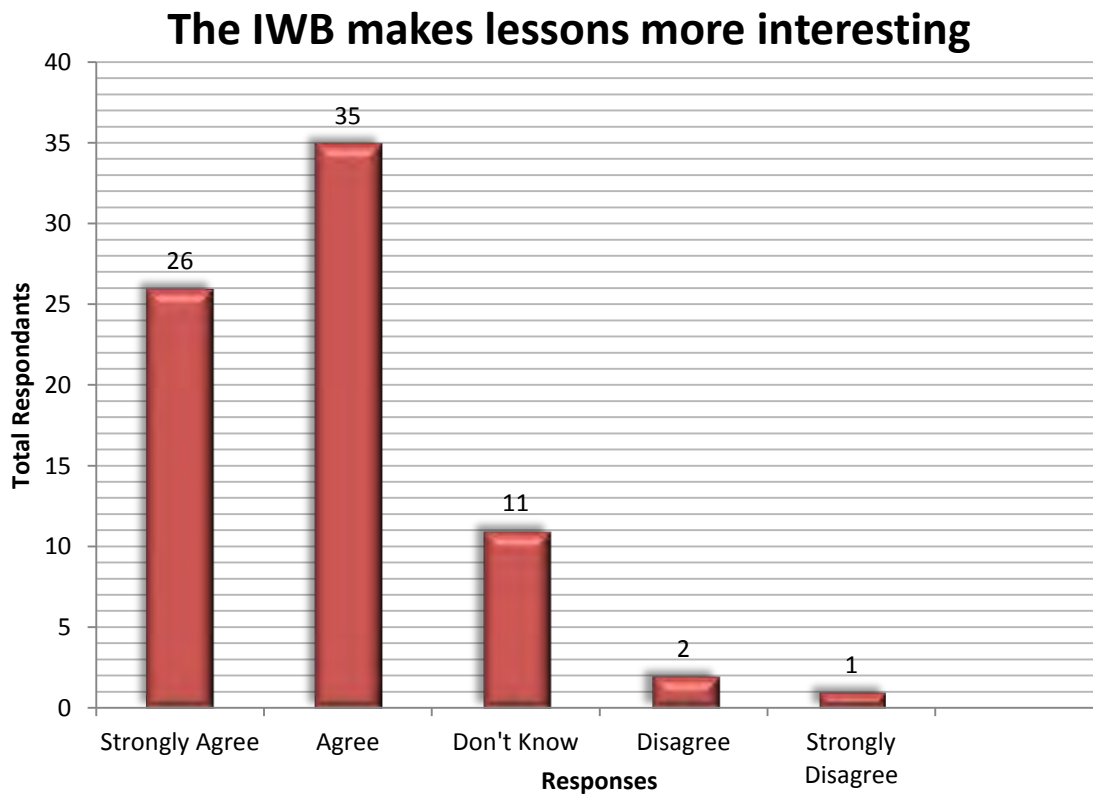


Figure 4.8: Student Response to level of interest in IWB

The student survey also asked for responses to the statement ‘I enjoy learning from the IWB’.

I enjoy learning from the IWB (Student Responses)

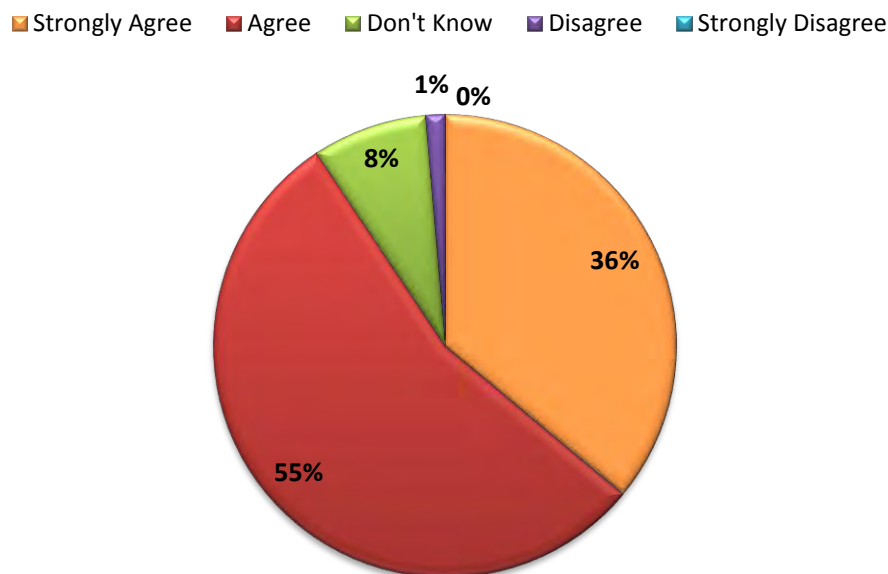


Figure 4.9: Student Responses to Learning from IWB

Figure 4.9 above illustrates that out of the 75 student respondents 90.7% said they enjoyed learning from the IWB.

Interactive Whiteboards are a relatively new addition to the primary classroom, 6 of the 30 teachers (20%) surveyed reported to having IWBs in their classroom for less than 2 years. Therefore the researcher decided to query the teachers on the notion of IWB as a novelty factor that could wear off in time (see figure 4.10) and found that 76.7% teachers disagreed.

By novelty factor the researcher means the newness of the IWBs as a teaching and learning tool makes it fresh and interesting for the students and teachers alike and therefore could be a contributing factor in enhancing the interest in lessons. This interest in turn could diminish as the children become accustomed through use over time.

The novelty of the IWB will wear off (Teacher Responses)

Strongly Agree Agree Neutral Disagree Strongly Disagree

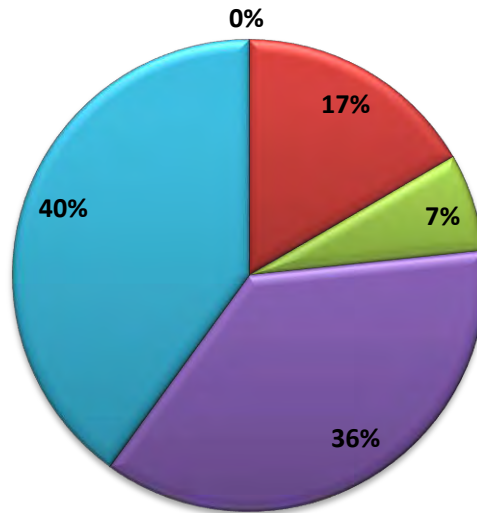


Figure 4.10: Teacher Responses to Novelty Factor

The same statement was posed at the focus group interview and revealed similar findings. It prompted a discussion on the reasons why this was not the case. One teacher when responding to the question *‘Is the IWB a novelty that will wear off?’* said *“No I don’t think so, because there are so many facets to it. A blackboard is just a blackboard, you can write on it, you can draw on it and that’s it, whereas, with the IWB you can do so much more. You can pull so much in, you can have your internet, your PowerPoint you’ve games, pictures...”* Other teachers nodded in agreement and added other attributes and facilities of the Whiteboard. In the interview with the school principal, the facility to include multimedia to lesson content was noted as a factor for student engagement; *“Yes and it’s something that’s changing all the time, the multimedia aspect of it, so they won’t bore of that.”* Another teacher noted the difference between IWB’s and traditional lesson delivery, the capability of using interactive games and resources to lessons *“Yes it’s something you couldn’t replicate without the board.”*

However although the majority of teachers disagreed with the notion of IWBs having a novelty factor, there were a number of teachers who believed this not to be the case with 17% of teachers responding in the questionnaire that IWB's are a novelty that will wear off. In the focus group interview with teachers there were some who also felt the boards may contain a novelty factor. One teacher commented; *“I think that the novelty could wear off, at the moment it's all new and exciting but when lessons from the board become the norm the gloss could wear off.”* Another teacher agrees and believes that unless teachers put the time into making lessons interactive, lessons could become more teacher-centered than child-centered *“Yes, to make lessons interactive takes a huge amount of time, you need to be so much more prepared and I suppose yes I could see how lessons can become didactic if that prep isn't put into them and not so interesting for the students.”*

Figure 4.11 below illustrates the responses of students to usage of IWB's in their classrooms.



Figure 4.11: Student Response to IWB usage in class

In order to gain an insight into classroom usage the researcher posed the statement ‘IWB’s are used in my class’ in the student survey. Figure 4.11 shows the 75 student responses. None of the students said IWB’s were used for all lessons, 27 students said IWB’s were used for most lessons, 37 students said they were used for some lessons, 11 students said they were hardly ever used while no student said IWB’s were never used in their class.

4.5 Section 3

4.5.1 Perceived benefits of Interactive Whiteboards

In order to ascertain the views of both primary school teachers and students regarding the benefits of using an IWB in the classroom the researcher collected data from the teacher questionnaire, student survey and interviews.

The ability to vary instruction was a benefit of the IWB which arose in the focus group interview, with teachers noting the many '*facets*' of the board which allowed teachers to add multimedia images and sound to lessons along creating a variety of different presentations. This in turn aids in inclusion of different learning styles in the classroom, 13% of teachers ranked accommodation of different learning styles as a number one benefit in the teacher questionnaire. Furthermore 93% of teachers agreed with the statement '*The IWB caters for all learning styles*'.

Another noted benefit was the way the board easily allows teachers to incorporate ICT into the curriculum, 90% of teachers said their classrooms were more interactive than before, 89.7% of teachers said they were using more ICT in their classrooms than before and 20% of teacher respondents ranked '*Helps to integrate ICT into curriculum*' as number one benefit of using IWBs. This also corresponded with the finding that 50% of teachers said they use the IWB for all lessons, a further 47% said they use it at least once a day while only 3% of teachers saying they rarely use it. A teacher from the focus group interview found that utilising the software that accompanies the board helps to integrate ICT into curricular areas. They also noted the competence confidence of students in using ICT with one teacher commenting "*Children are very familiar with the board the 2nd class students take out the laptop every morning and set up the interactive whiteboard. They use it a lot*". Another teacher agreed adding "*The infants use it as part of their play session in the morning. They all interact with it. One of them was showing me where to find things!*" The student attitude to IWBs survey also had findings regarding the benefits of having IWBs in their classrooms with 88% of students saying they feel comfortable using the IWB and 80% believing it is important for them to know how to use the IWB.

Teachers also feel that using the IWB has improved their teaching with 93% of teachers in agreement and a further 47% said that the student's standard of work had improved since IWB installation.

In the student attitude to IWB survey 75% of students agreed with the statement *'I learn many new things when my teacher uses the IWB'*. Teachers in the focus group interview noted that through using the board and its accompanying software their lessons were enhanced. An infant teacher noted IWB tools she found effective in teaching literacy *"Literacy tools are good, for infants they have a writing tool, a writing frame which is excellent. It can be used to introduce the letters and work with them. A little reveal tool, to model the writing. There are very good tools on it to aid with writing and developing writing skills with infants"*.

The school principal, who is also a class teacher, spoke about the boards accompanying tools saying *"The maths ones are excellent you have tools to aid with all mathematical areas, shape, using protractors, angles, symmetry things like that it's fabulous for that"*. There were corresponding findings from the student survey with 58% of students reporting that they find it easier to remember facts see figure 4.21 (Appendix M) and information when learning from the IWB and 82% of students believing the IWB makes lessons more interesting (see figure 4.8).

4.5.2 Perceived Drawbacks of Interactive Whiteboards

Many of the findings regarding drawbacks to IWB use were technical in nature with 70% of teachers agreeing that technical problems were common. In the focus group interview technical problems were also found to be an issue, one teacher commented *"I have issues with connectivity. I find that on shutting down the computer it can take an age to get interactivity again. I might have to shut it down again two or three times before the interactivity aspect will work again. Between turning it off and trying again, getting a bulb to cool down and waiting. And that's just a nuisance"* and another adding *"Yes I too find persistent problems in particular with the interactivity of the pen it just doesn't connect to the board. It means again usually having to shut down and restart but again that doesn't always work and when you have a class waiting, you're messing with it for a while, you just end up abandoning it"*. Similarly the student survey found 65% of students agreeing with the statement *'Technical problems such as screen freeze and pen problems are common'*. A further 39% of students reported that using the IWB can be frustrating sometimes. Reasons for this frustration were also mainly technical with children remarking on issues such as;

screen freeze, difficulty gaining pen interactivity and glare from the windows onto the board causing lessons disruption.

In the teacher attitude to IWB questionnaire teachers were asked to rank ten perceived drawbacks of IWBs use with number one being the most problematic and number ten being the least problematic. Findings for percentage number one drawbacks to using an IWB in the classroom are illustrated in figure 4.12 below.

Ranked Disadvantages of IWB's (Teacher Responses)

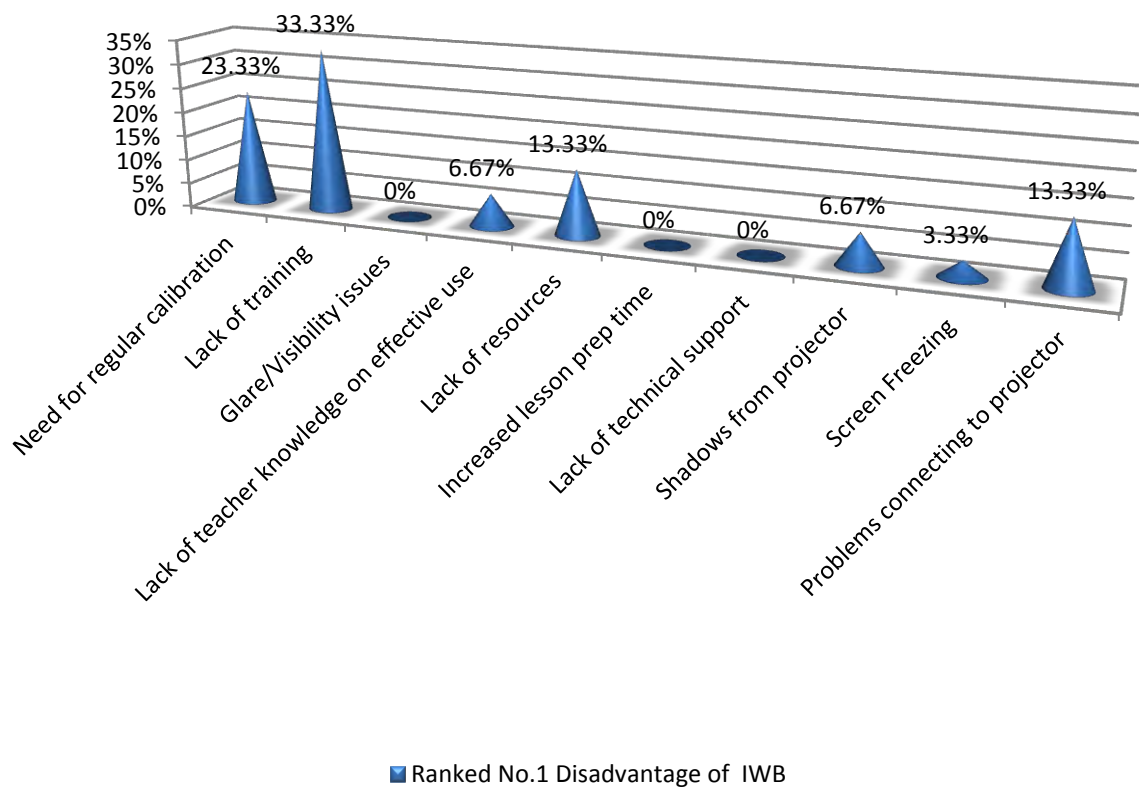


Figure 4.12: Ranked Disadvantages of IWB's

The biggest drawback of the IWB was lack of training with 33.3% of teachers ranking this as most problematic. Again in the questionnaire 100% of teachers agreed that there is a need for better training in IWB use. The issue of training was also discussed at the focus group interview with teachers commenting on insufficient training “*We only got about one day though, well not even a full day*” and admitted to needing further training.

Other noted drawbacks from the focus group interview were lack of sufficient interactive resources for use with the boards with many also agreeing that lesson preparation for IWB's took longer than preparation time for traditional style lessons; *'What I find is that you could be trawling for an age (on the internet), if you're looking for a lesson'* and another adding; *'It's very time consuming'*. There were corresponding findings again in the teacher questionnaire with 53.3% of teachers agreeing that lesson preparation with the IWB takes longer.

4.6 Teacher collaboration

Another finding which emerged from the focus group interview with teachers was the need for more collaboration regarding IWB use. Collaboration between teaching staff and also collaborating with other schools was noted as something which was needed. They felt it would also help to alleviate some of the existing drawbacks such as lack of resources for effective use of IWB. One teacher noted; *'If someone knows of a good resource or where to find them they could share within the staff'* with another adding *'if there was a forum where other schools could share too'*. Similarly in the teacher questionnaire 83.3% of teachers agreed that teachers should share IWB resources more.

Another aspect of teacher collaboration which arose in the focus group interview was the benefit it has regarding technical support. Teachers reported that when they encountered technical difficulties with the board they tended to look for assistance from other *'more technically minded'* staff members.

4.7 Conclusion

This chapter presented the findings from the research study. Data collections tools used to compile the findings included student testing, student survey, classroom observations, teacher questionnaire, focus group interview and principal interview. Chapter five will analyse the findings in light of the research presented in chapter two, the literature review.

Chapter 5

Discussions of Key Findings

5.1 Introduction

This chapter discusses the findings of the comparative case study into Interactive Whiteboards as effective motivational learning tools in the primary classroom. An analysis of the findings is made in relation to the studies outlined in the literature review. Additional findings which emerged during the study are also presented here.

5.1.1 Overview of Research

The comparative case study was two-fold firstly it set out to examine the effects of using IWBs as teaching and learning tools as opposed to traditional teaching methods. Secondly, it wanted to determine the motivational effect of the IWB on student learning. This was achieved by examining the views of primary school teachers and students regarding IWBs. Fifteen primary schools throughout North Tipperary participated in the study which consisted of thirty primary school teachers and one hundred and twenty primary school students.

In order to establish the effect of using IWBs as opposed to traditional teaching methods a comparative case study was conducted between two groups of 27 students of similar age and learning ability. To assess the motivational aspect of IWBs and to establish the views of primary school students of IWBs a student survey was devised and administered to seventy five primary school students. Other data collected from students included classroom observations of students while learning from the IWB where field notes were taken, a focus group interview with six primary school teachers and an interview with a primary school principal. An online teacher attitude questionnaire was also devised in which thirty teachers responded. Assessment results, student and teacher responses and observations were recorded and included in this study.

5.1.2 Key Findings

Similar themes emerged from the literature review and the research findings which will be discussed. The three areas explored which correspond with the study's research questions are findings regarding the quality of learning achieved from the IWB, the enhanced motivational effect of the IWB and the benefits and drawbacks of using the IWB for teaching and learning in the Primary school.

The key findings in this study were:

- 100% of the teacher questionnaire respondents agreed that all classrooms should have an IWB.
- Students from both experimental and control group displayed a high level of interest in the lesson content and all students were actively engaged with full participation during lesson delivery.
- In further classroom observations of IWB use the researcher noted high levels of enjoyment in the interactive lessons.
- On comparing the percentage increase in test results of control and experimental groups there is only a 1% difference between the groups with the experimental groups percentage test increase trending slightly above the control group.
- 97% of the teacher questionnaire respondents stated that IWB's help to increase attention and motivation in students with 40% of teachers ranking '*increases student motivation*' as the number one benefit of using IWB's in the primary classroom.
- 93% of teachers agreed that the IWB can cater for all learning styles. Teachers in the focus group interview attributed this to the ability to create multiple representations of the same material in lessons.
- Data collected from the questionnaire and focus group interview indicated there is a need for collaboration amongst teachers and whole school staff with regard to using IWBs effectively. Namely in the activating and sharing of resources for use with IWB, training and technical support. For effective IWB use teachers need to feel confident in their ability to use the technology which requires on-going training and technical support. The teacher questionnaire and focus group interview found that initial training was insufficient with many teachers expressing a need for further training.

5.1.3 Presentation of Findings for discussion

This section presents the key findings in more detail and determines if they are consistent with current research in the area as outlined in the literature review. The findings will be analysed under the following areas with some overlapping; the quality of learning from the IWB, the enhanced motivational effect of the IWB and findings regarding integration of the IWB in a teaching and learning setting.

5.2 Quality of learning from IWB

The first research question addressed in this study was; are IWBs effective teaching and learning tools in primary schools? Findings from the questionnaire suggest that they are with 100% of teachers surveyed believing that all primary school classrooms should have an IWB. This study also found that teachers were generally positive regarding the quality of learning which can be achieved using IWB with 93% of teachers believing the IWB has improved their standard of teaching. However findings from the comparison of pre and post-tests show very little difference (1%) between the experimental and control groups as regards performance. This study like studies (Lemke & Fadel, 2006; Cuthell, 2005) found that ultimately the enhanced quality of the learning arose from increased motivation and interactivity rather than evidence of greater learning. Also it must be noted that both lessons were identical apart from teaching tool, the experimental group received a lesson from the IWB while the control group lesson received an identical lesson using traditional methods, both lessons involved active participation from the students. The class teacher of the control group observed the following *“I would say that the class certainly appeared actively engaged with the activity. There were lots of questions asked and answers offered and they seemed to enjoy it. The subject matter was of great interest to one particular pupil. He loves everything to do with maps and flags. The rest of the class were eager to see how much he knew and some to see if he would get anything wrong, (he didn't)”* therefore it could be concluded that regardless of teaching tool active participation results in greater lesson enjoyment.

Cuthell (2005) along with many others (Bransford et al, 2002; Gredler, 2004) asserted that the IWB can enable teachers to support a wider range of learning styles than may have been possible previous to IWB implementation in classrooms. This study found also found this to be the case with 93% of teachers surveyed agreeing that the IWB can cater for all learning

styles. Cuthell found that the interactivity engaged almost all the learners and thus enhanced their progress. Lemke and Fadel (2006) and studies from (Kennewell & Beauchamp, 2007; Lewis, 2009) also concluded that the increased interactivity along with increased visualisation of the IWB's enabled more reflective dialog between student and teacher and thus contributed to learning. This study noted during observations of both classroom use of IWB and observations of the experimental group that students displayed a high level of interest in the interactive lessons with all students actively engaged which included much discussion with teachers. Miller and Glover (2004 a) noted the specific software manipulations of the IWB as a major factor in student engagement. Studies from (Higgins et al, 2007; Hall & Higgins, 2004; Beeland, 2002) also found such manipulations supported learning and teachers in this study also highlighted this aspect of the board as one which engaged both the teacher and student alike. Teachers reported that specific interactive features for use with different subject areas were *excellent* with all agreeing that the tools for use with maths and literacy were particularly useful for interactive work with the students. Teachers did report in both interview and questionnaire (53%) that lesson preparation can take longer for IWB however teachers in focus group concluded that the lesson quality was superior. Collaborative work among peers regarding the sharing of resources and expertise was suggested as an aid to decrease workload and enhance lesson quality. The area of teacher collaboration is discussed further later in the chapter.

5.3 Enhanced motivational effect of IWB

The second research question in this study was; does the IWB have any effect on student motivation to learn? Answers to this question were determined through examination of student and teacher views using tools of questionnaire, survey and interviews and also through classroom observation use of IWB's. Findings from this study support previous studies (Clemens 2001, Weimer 2001, Beeland 2002, Becta, 2003, Cuthell 2005, McGann 2006, Kennewell & Beauchamp 2007, McKeown, 2010) on the IWB's enhanced motivational effect on students. This study found that 97% of the teacher questionnaire respondents agreed that IWB's help to increase attention and motivation in students and 40% of teachers ranked '*increases student motivation*' as the number one benefit of using IWB's in the primary classroom. Mc Keown (2010) referred to IWB as 'kid magnets' and noted in particular the hands on physical interaction as appealing to students.

Kennewell & Beauchamp (2007) believed it focused learner's attention and also found it was common for children to be keen to access the board. This physical interaction was also mentioned in the focus group interview as something which all the children *'perk up to'* with another teacher adding *'they are all mad to go up to the board'*. Classroom observations of IWB use also found students keen to interact (see appendix). However during some classroom observations the researcher found that some students felt they didn't always get a fair chance to access the board with phrases such as 'Will everyone get a go?' and 'I never get a go!' heard on occasion. This also highlights the appeal of the IWB and the engaging effect it has on the students. Teachers when probed on this matter responded that it isn't always possible for all students to interact with the board at every opportunity and added that even children that were not physically involved were more focused during interactive lessons which also supports Smith et al (2006) finding that the IWB captures and holds pupils attention for longer. Furthermore this study's online teacher attitude questionnaire found 97% of teacher respondents believe that IWBs help to increase attention and motivation in students. The questionnaire also found that 40% of teachers ranked *'increases student motivation'* as the number one benefit of using IWBs in the primary classroom. Teachers also disagreed with the notion of IWBs being a novelty that would wear off in time for the students as they are a relatively new addition to many schools. They dismissed that this could be a factor in the increased motivation adding that the capabilities of the IWB in incorporating a variety of ways of presenting lessons would continue to hold the interest of the learner; *"Yes and it's something that's changing all the time, the multimedia aspect of it, so they won't bore of that."* 47% of teachers also agreed that student standard of work has improved since using the IWB. The student's perspective was also positive with the student survey finding that 90.5% of students agreeing that the IWB makes learning fun and sixty one of the seventy five students surveyed agreeing they make lessons more interesting. This is reminiscent of Tapscott (1998) hypothesis on today's learners being dissatisfied with being mere recipients of knowledge rather they prefer to discover for themselves through interactive learning. Seymour Papert (1993), one of the founding members of constructivism believed that students learning increased when they were active participants in their own learning. It must be noted that although the findings of this study suggest IWBs can enhance student engagement and motivation, it is the nature in which the board is used, in particular when students are interactively involved in lessons that determines this enhanced engagement.

The effect of ICT on learners' attainment depends crucially on the teacher, the pedagogical approach adopted, the ICT resources employed and the learning objectives intended (Cox & Abbott, 2004).

The board is merely a tool with the capability and cannot be seen as an end in itself.

5.4 Findings regarding Implementation of IWB

The third research question that this study strove to answer was; what do primary school teachers and students perceive to be the benefits and drawbacks of using the IWB in the classroom? This question is partly answered above as a major benefit of using IWBs is their motivational appeal and also aspects were answered in the first research question regarding quality of learning. To fully answer this question the study found that it was essential to look at how it is implemented into the primary school classroom and analyse what both teachers and students view as the advantages and disadvantages of using them for Education.

Betcher (2009) found that in order to fully implement the IWB into teaching and learning effectively teachers need to change both content and methodology. This process takes time and its transformation is three-fold from teaching *old things in old ways* to *teaching old things in new ways* to finally *teaching new things in new ways*. The teacher respondents in this study were at differing stages of adapting to the new technology depending on length of time with the board and individual ICT experience. The majority of teachers in the focus group were also going through this transition, IWB use was causing their teaching methodology to change. They are still teaching the same content but have begun to change the way they teach it, using the IWB tools to be more creative with lessons. They are using a wider variety of presentation methods such as importing media files and PowerPoint presentations to create more interactive lessons. Much of the feedback from teachers was positive and there was a real sense of enthusiasm with regard to the capabilities of the IWB. Teachers acknowledged that they have more to learn, that they would like to be more confident with the board and that they are aware of its capabilities in transforming the ways in which they teach. One teacher referred to it as a *powerful tool* which they should use more.

Armstrong et al (2005) suggested that the potential of the boards are not often realised. This sentiment was echoed in this study with teachers aware of the capabilities the board can bring to their teaching but they have been unable to fully implement them.

Becta (2004) also stated that it takes time to fully integrate the IWB into everyday practice and Haldane (2007) found it took about two years for the IWB to become embedded into teacher's pedagogy. Cuthell (2005) believes that in many ways it is dependent on teacher attitudes in gauging how long it may take to adopt new methodologies.

Fuller and Hargreaves (2001) suggest that teaching can be a solitary experience and teachers can find adapting to new teaching culture difficult and that many continue to teach in the traditional style. They suggest that schools that collaborate and 'redefine their role' can adapt to cultural and educational changes more readily and therefore transform the way they teach to suit the needs of their pupils. They conclude that schools achieve this through new ways of thinking and acting. The teachers in this study too spoke of a need for change, in particular regarding collaboration. As with all new changes teachers need time to adjust. The focus group teachers stated they were not as confident as they would like to be with the IWB and felt that a solution to this might be collaboration with each other and with other primary schools.

Simon Lewis (Anseo.net) too spoke of the importance of working collaboratively and felt the IWB helps to '*break down the walls of the classroom*' thus aiding collaboration with other teaching staff. The focus group in this study also mentioned that they tended to seek assistance from others regarding technical matters or resources for the IWB and expressed a wish to collaborate more regarding such issues. The teacher questionnaire reported that only 18% of teacher's source materials for use with IWBs through colleague sharing and 29% of teachers source materials from web sharing resources. Furthermore 100% of teachers agreed that teachers should share IWB resources more.

The subject of classroom usage of IWBs was also explored in this study with similar statements posed to teachers in the questionnaire and students in the survey. The findings do not correspond with 50% of teachers claiming they use the IWB for all lessons while only 27 students (36%) said the IWB was used for most lessons. However, it is important to note that both samples were different. The student sample only came from two of the participating schools while the teacher sample contained 15 schools. Therefore students who completed the survey could only correspond to three of the teachers who may have completed the teacher questionnaire. However, it could be the case that the eleven students (15%) who reported that the IWB was hardly ever used in their classroom could correspond to the teacher who reported that they rarely used it (see figure 4.11 in findings chapter 4).

Although the teacher questionnaire found that usage was generally high (figure 4.18 Appendix M) with 97% claiming to use the IWB at least once a day, on analysing all the data collection tools of student and teacher surveys, observations and interviews you get the impression that in general usage could be better.

Training in IWB use and technical issues were a drawback which was highlighted in previous research (Hall & Higgins, 2004; Higgins et al, 2007) and findings of this study suggest the issue still exists with the full complement of teachers in the study reporting on insufficient initial training and expression of interest in further training. Teachers and students remarked on frustration caused by persistent technical issues such as screen freezing, computer connectivity and visibility issues caused by glare from windows. Many of these technical issues could be easily rectified if teachers had access to proper training. It is imperative that teachers receive development training in ICT and in particular in use of IWB in order to have the confidence and knowledge to progress through the stages of implementing the IWB into classroom pedagogy.

The Government recognises the need for investment in this area and is committed to providing funding to support the integration of information communications technology in teaching and learning in our schools. Primary schools will be asked to ensure that the recommended baseline equipment of a teaching computer with wireless mouse and keyboard and a fixed digital projector is installed in every classroom. This is in line with recommendations in the *smart schools smart economy* report (Department of Education, 2010).

Government policy however was aspirational as provision of ICT in the primary setting remains inadequate with regard to the provision of a framework in which teachers can adapt to the technology.

5.5 Conclusion

On comparing the IWB with traditional teaching methods this study found very little difference regarding enhanced learning. It found that both experimental and control groups were actively engaged and displayed high levels of interest in the lessons. Therefore could it be the case that perception of IWB capabilities is greater than reality? Regardless of the teaching tools children who are actively involved in their learning are more motivated to learn. However this study also found that the IWB can provide a medium for interactive

learning while also incorporating ICT into curriculum. The Department of Education have endeavoured to increase ICT usage within schools for over a decade. With new policies and funding initiatives they have been successful in part with many schools now adopting IWBs and integrating ICT into curriculum. McGann (2006) found that 90% of his respondents believed that the introduction of the IWB has made it easier to incorporate ICT into teaching and similarly 90% of teachers in this study reported that they are using more ICT now than before they had an IWB. However, the broader issue still needs to be addressed that of aiding teachers in implementing the necessary pedagogical changes and equipping them with new strategies which will encourage collaborative work within schools.

Findings from the focus group interview and teacher questionnaire support studies (Fullan & Hargreaves; Lewis, 2009) which suggest a need for teacher led collaborative communities to enhance IWB use. Such communities can provide current and future teachers a medium in which to share resources and expertise for effective classroom use. This study found that all of the teachers surveyed feel that an IWB should be in all classrooms and teachers in the focus group agree that they are an excellent motivational teaching and learning tool. Teachers have reported on many positive aspects such as its engaging interactivity, enhanced motivation of students and its variety of presentation which appeals to different learning styles. However, on the other hand they have also expressed a major drawback to having an IWB is insufficient training and technical support. The findings from this study suggest that initial and on-going training and technical support is essential along with opportunities to access and collaboratively share peer resources. Only then can teachers have the confidence to use the technology adequately and overcome technical issues should they arise.

Chapter Six

Conclusion

6.1 Introduction

Government policies (DES, 2007; DES, 2009) have resulted in many primary schools incorporating ICT into whole school policies and teaching methodology. For this reason along with the recent upsurge in Interactive Whiteboard implementation into primary schools throughout the country the researcher endeavoured to answer the question ‘Are IWB’s effective motivational teaching and learning tools in the primary school?’

This study aimed to answer this question by measuring the quality of learning which is achieved from the IWB as opposed to traditional teaching methods, through assessing the motivational effect if any of the IWB on student learning and exploring the perceived benefits and drawbacks students and teachers encounter in the use of IWB in the primary school classroom.

This chapter will provide a short summary of the research findings and give recommendations for future research.

6.2 Outcomes of the Comparative Study

This study found that regardless of the teaching tools used, children who are actively involved in their learning are more motivated to learn. Studies by Seymour Papert (1993) and Vygotsky (1968) found that learning is enhanced when the child is an active participant. Both groups of students (control and experimental) were actively involved in the lesson, both groups enjoyed the lesson and both groups performed similarly when tested. Therefore this study did not find IWBs are a more effective learning tool as initially set out in the research questions. Another comparative study where students are more passive learners receiving a more didactic style of lesson delivery may produce different results. However this study did conclude that the IWB can provide a medium for interactive learning while also incorporating ICT into curriculum. Participating teachers reported on many positive aspects of the IWB

such as its engaging interactivity, the enhanced motivation of students and its variety of presentation modes which appeals to different learning styles. Participating students also responded positively to IWB use with the majority of students believing that they aid in the memorisation of facts and that learning is more interesting and fun from an IWB. The researcher also noted that students displayed high levels of enjoyment in classroom observations. Therefore one can conclude that the IWB is an effective motivational tool for teaching in the primary school. This study found that many of the key benefits of using the IWB were related to increased student motivation to learn which was attributed to the specific interactive and presentation capabilities of the IWB and the constant developments in digital media.

The IWB has been proven to appeal to both students and teachers alike however the tool is only as good as its user. Simply using the board for lesson delivery does not automatically enhance the learning experience. The board cannot be seen as an end in itself, it's *how* the board is used. This study found that the IWB has the capability of providing a highly interactive learning environment in which children can be active agents in their own learning. However this is only possible if the teacher is competent and confident in using it effectively. Regardless of government policy and funding to *effectively invest* in ICT in education this study found there are drawbacks concerning the implementation of IWB. The issue of accessing suitable resources for use with the board was a noted drawback by the teachers of this study. There is insufficient provision of technical support and training for teachers for effective classroom use of IWBs. Teachers and students remarked on frustration caused by persistent technical issues which often resulted in teachers abandoning the IWB in favour of other teaching methods. This study found that such issues could be easily rectified if teachers received sufficient training and support. A need for teacher collaboration was also highlighted in this study. It is felt that collaboration among peers and within teaching communities could help to alleviate some of the drawbacks and provide a medium in which teachers can work collaboratively in the creation and sharing of resources and expertise.

6.3 Recommendations

There are still many issues in relation to classroom implementation of IWBs in primary schools that need further examination. For primary schools that use or are considering using IWBs for teaching and learning this research study has the following recommendations for consideration:

- All of the teacher participants in this study expressed a need for further training in IWB use. It is a recommendation that the Department of Education provide funding for initial and on-going training for teachers in use of IWBs.
- IWB technical issues were found to be commonplace for all student and teachers in this study. Schools and Boards of Managements need to budget for ICT in particular for the maintenance and technical assistance regarding IWB equipment. A recommendation is that all primary school ICT co-ordinators receive initial and on-going training in the upkeep of all ICT equipment within their school.
- All teacher participants responded that they would like more collaboration between teachers regarding sharing of resources for use with the IWB. Teachers of the focus group study were in favour of establishing a forum in which they could share resources with each other and within the teaching community. They found it both difficult and time consuming to source resources for use with the IWB. It is recommended that schools compile a list of resources that are easily accessible to all teachers within the school. Resources which are teacher and student friendly and designed to cater for the specific class level and curricular area. It is also recommended that the Department of Education perhaps in conjunction with the NCCA or NCTE host such a forum where teachers have access to interactive resources in line with the Irish primary school curriculum. Teachers can then begin effective collaboration in incorporating ICT into the primary curriculum.

- Observations conducted in this study noted increased levels of motivation in student participants at times where they were physically interacting with the IWB. It is recommended that teachers give time to preparing lessons that involve active participation, during lesson preparation to note appropriate instances where there could be opportunities for active learning with the IWB.
- Teacher training institutions and education centres throughout the country must equip student teachers with adequate training not only in effective use of IWB's but also with the ability to create specific and differentiated lessons for each class level and curricular area and with the knowledge of how to access further resources for use in the classroom.
- Teachers of this study found it both difficult and time consuming to source resources for use with the IWB. It is recommended that schools compile a list of resources that are easily accessible to all teachers within the school. Resources which are teacher and student friendly and designed to cater for the specific class level and curricular area.
- A practical recommendation to schools considering purchasing IWB's is to ensure the board is easily accessible and visible to all. The position and height of the board is important in ensuring students can access it. It is also recommended that it is placed out of direct sunlight where possible to avoid glare on the board and to ensure blinds are fitted onto windows to provide optimum viewing conditions.

6.4 Recommendations for future research

IWBs are a relatively new addition to Irish primary schools. Much can be learned with future research. The researcher of this study believes that the following studies may provide interesting findings regarding effective use of IWBs in primary schools.

- This study found very little difference regarding enhanced learning of research participants. Another comparative study where a larger sample size of students are exposed to a more didactic style of lesson delivery as opposed to an interactive lesson using the IWB may have a different outcome.

- An action research study over a longer period of time (one school year) of one educational settings use of IWBs would allow the institution a more comprehensive opportunity to reflect on current practice and implement change where required.
- Investigate the number of primary schools who invested in IWBs as a direct result of funding from the Department of Education's action plan '*Smart schools for a smart economy 2009*'. It would be interesting to ascertain if a link exists and to find out why they chose to invest in IWBs for their school.
- A comparative study of Irish teacher's use of digital resources for IWBs as opposed to another country which also uses IWBs for teaching and learning at primary level. This would be interesting to see differences in usage of the IWB internationally.

6.5 Conclusion

This comparative study has examined the effectiveness of the IWB as a motivational teaching and learning tool in the primary school and has made some interesting findings. This study found that since IWB implementation the majority of teachers surveyed (90%) are incorporating more ICT into curriculum and planning. Furthermore 93% of teachers agree that using the IWB caters for more learning styles. While this study didn't show increased learning as a result of IWB use 93% of teachers surveyed said the IWB has improved their teaching. However this study also found that students and teachers are dissatisfied with how the IWB has been implemented into teaching and learning. In many cases it seems that teachers are expected to know how to use the technology without receiving sufficient training, they are left to *self-teach* or seek assistance from the more *technically minded*. Teachers need to be able to source digital resources that will enhance the learning in their classrooms. The lack of training and technical support means that many teachers are burdened with a new tool which promises endless capabilities but cannot be fully realised. First and foremost this matter of training and technical support needs to be rectified only then can a vision of collaborative teaching community to enhance interactive learning be realised.

At the conclusion of the focus group interview with primary teachers the researcher asked for final thoughts. I think it is an appropriate final statement for this research study.

I appreciate that I've a powerful tool in my room that I'm not making the most of and maybe that is something that we/I should start changing (focus group teacher).

Bibliography

- Armstrong et al (2005) '*Collaborative research methodology for investigating teaching and learning: the use of interactive whiteboard technology*', Educational Review in Higgins, S., Beauchamp G. and Miller D. (2007) '*Reviewing the literature on interactive whiteboards*', University of Durham, UK; Swansea Institute of Higher Education, UK; 'Keele University, UK. Learning, Media and Technology 32.3 (2007): 213-225.
- Ball, B. (2003) Teaching and learning mathematics with an interactive whiteboard, micromath in Higgins, S., Beauchamp G. and Miller D. (2007) '*Reviewing the literature on interactive whiteboards*', University of Durham, UK; Swansea Institute of Higher Education, UK; 'Keele University, UK. Learning, Media and Technology 32.3 (2007): 213-225.
- Beauchamp, G. (2004) '*Teacher use of the interactive whiteboard in primary schools: toward an effective transition framework*', Technology Pedagogy and Education, 13 (3), 327-348.
- Beauchamp G. and Miller D. (2007) '*Reviewing the literature on interactive whiteboards*', University of Durham, UK; Swansea Institute of Higher Education, UK; 'Keele University, UK. Learning, Media and Technology 32.3 (2007): 213-225.
- Becta (2003a) '*What the research says about ICT and motivation*'. The British Educational Communications and Technology Agency, Coventry, England.
- Becta (2003b) What the research says about interactive whiteboards. The British Educational Communications and Technology Agency, Coventry, England.
- Becta (2004) '*Getting the most from your interactive whiteboard- A guide for primary schools*', British Educational Communications and Technology Agency, Coventry.
- Becta (2006) '*The Becta Review 2006: evidence on the progress of ICT in education*' Coventry, Becta.
- Becta (2006) '*Teaching Interactivity with electronic whiteboards in the primary phases*' Coventry Becta.
- Becta (2007) '*Emerging Technologies, guidelines for learning*' Volume 2, 2007, Coventry Becta.

Beeland, William D. "Student engagement, visual learning and technology: can interactive whiteboards help?" Annual Conference of the Association of Information Technology for Teaching Education, 2002.

Bell M.A. (1998) 'Teachers' perceptions regarding the use of the Interactive electronic whiteboard in instruction'. [online] <http://www.smarterkids.org/research/paper6.asp> [accessed 22nd March 2013].

Bell, J. (2005) 'Doing your research project – A guide for the first time researchers in education, health and social science, 4th ed'. Berkshire, England: Open University Press.

Belkin and Gray, (1977): cited by Forrest (2000) 'Overview of Learning Theories' Forrester & Jantzie p.211.

Betcher C. & Lee M. (2009) 'The Interactive Whiteboard Revolution', Australian Council for Educational Research Ltd, 19 Prospect Hill Road, Camberwell, Victoria, 3124, Australia.

Bransford et al (2002) 'How people learn: brain, Mind, Experience and School' cited in Hall, I. & Higgins (2005), S. 'Primary School students' perceptions of interactive whiteboards' School of Education, Communication and Language Sciences, University of Newcastle upon Tyne, Newcastle Upon Tyne, UK : 102 -117.

Cambell, D. T. and Fiske, D. W. (1959) 'Convergent and discriminant validation by the multitrait-multimethod matrix' in Cohen, L., Manion, L. and Morrison K. (2011) 'Research Methods in Education' 7th Edition, Routledge Taylor & Francis Group, London and New York.

Cavan, S. (1977) Review of J.D. Douglas's (1976) 'Investigative Social Review: Individual and team Field Research' in Cohen, L., Manion, L. and Morrison K. (2011) 'Research Methods in Education' 7th Edition, Routledge Taylor & Francis Group, London and New York.

Cláir Bhána Idirghníomhacha (Interactive Whiteboards) (2007) 'Early Findings from an Irish Project' [online] cbiproject.net/iwbEDMedia2007paper.pdf [accessed 12th July 2012].

Clemens, A., Moore, T. and Nelson, B (2001) cited in Higgins, S., Beauchamp G. and Miller D. (2007) 'Reviewing the literature on interactive whiteboards', University of Durham, UK;

Swansea Institute of Higher Education, UK; 'Keele University, UK. Learning, Media and Technology 32.3 (2007): 213-225.

Cogill, J. (2006) '*You Can...Use an Interactive Whiteboard*'. Warwickshire: Scholastic.

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

Cogill, J. (2002) 'How is the interactive whiteboard being used in the primary school and how does this affect teachers and teaching' [online]

http://www.activewhiteboards.co.uk/IFS_Interactive_whiteboards_in_the_primary_school.pdf

[accessed 15th December 2012].

Cohen, L., Manion, L. and Morrison K. (2011) '*Research Methods in Education*' 7th Edition, Routledge Taylor & Francis Group, London and New York.

Conway, P. (2000) '*Schools Information Technology (IT) 2000: Technological Innovation and Educational Change*' An Irish Educational Studies 19, 221-224.

Cooper, D.C. and Schindler, P.S. (2001) Business Research Methods (seventh edition).

Cox M. and Abbott C. (2004) '*A review of the research evidence relating to ICT attainment*', in Kennewell, S. & Beauchamp, G. (2007) '*The features of interactive whiteboards and their influence on learning*' Learning, Media & Technology 32(3), 227-241.

Cosgrove J. and Marshall, K. (2008) '*ICT Access and Usage in Irish Primary Schools Identifying the Gaps*' The Liffey Press Dublin Ireland.

Cuthell, J.P. (2005) '*Seeing the meaning. The impact of interactive whiteboards on teaching and learning*', Proceedings of WCCE 05 Stellenbosch South Africa: 1-7.

Denscombe, M. (2009) '*Item non-response rates: a comparison of online and paper questionnaires*' in Cohen, L., Manion, L. and Morrison K. (2011) '*Research Methods in Education*' 7th Edition, Routledge Taylor & Francis Group, London and New York.

Denzin, N.K. and Lincoln, Y. S. (2004) '*The Sage handbook of Qualitative Research*' Sage Publications, Los Angeles California USA.

Department of Education and Science (1997) '*Schools IT 2000: A Policy Framework for the New Millennium*', Dublin: Government Publications.

Department of Education and Science (1999), '*Curriculum na Bunscoile Teacher Guidelines for Social Scientific & Environmental Education*'.

Department of Education and Science (2000), '*Blueprint for the Future of ICT in Irish Education*' Ireland DES Government Publications.

Department of Education and Science (2007) '*Investing effectively in Information and Communication Technology in Schools 2008 -2013*' Dublin: Government Publications.

Department of Education (2008), Inspectorate Report '*ICT in Schools Initiative*' Inspectorate report, Dublin: Government Publications.

Department of Education Inspectorate (2008), '*The Impact of ICT on Teaching and Learning*' Ireland DES Government Publications.

Department of Education and Science (2009) *Smart Schools = Smart Economy*, [online] http://www.education.ie/servlet/blobServlet/icu_smart_schools_smart_economy.pdf [accessed 5th January 2013].

Department of Education and Science (2010), *Press Release 3 November 2010*, Ireland DES, Dublin.

Druin, A.; Bederson, B.; Boltman A; et al. (1999): '*Children as Our Technology Design Partner*'. In: Druin, A. (ed.): *The Design of Children's Technology*. San Francisco, CA: Morgan Kaufmann.

Druin, A. (2005): *What Children Can Teach Us: Developing Digital Libraries for Children with Children*'. *The Library Quarterly*. Vol. 75.

Edwards, J., Hartnell, M. & Martin, R. (2002) '*Interactive whiteboards: some lessons for the classroom*', *Micromath*, 18 (2), 30-34.

Fullan, M. and Hargreaves A. (1991) *'What's worth fighting for in your school?'*; Working together for improvement, Open University Press in association with the Ontario Public School Teachers' Federation 70 – 139.

Futuresource Consultancy (July 2010) *'Analysing the Future of Classroom Display Technology'* [online] http://www.futuresource-consulting.com/press/2010-07%20FutureOfClassroomDisplayTechnology_release.pdf [accessed 5th December 2012].

Frankfort- Nachiamias, C. and Nachmius, D. (1992) *'Research Methods in the Social Sciences'* in Cohen, L., Manion, L. and Morrison K. (2011) *'Research Methods in Education'* 7th Edition, Routledge Taylor & Francis Group, London and New York.

Gardner, H. (1983) *'Frames of Mind: The Theory of Multiple of Multiple Intelligences'*, New York, Basic Books.

Given, L.M., (2008) *'The Sage Encyclopaedia of Qualitative Research Methods'* Vol.2 Sage Publications, Los Angeles California USA.

Glover, D., Miller, D., Averis, D. and Door, V. (2005) *'The interactive Whiteboard: a literature survey Technology, Pedagogy and Education'*, 17 (1) 20-23 in Higgins, S., Beauchamp G. and Miller D. (2007) *'Reviewing the literature on interactive whiteboards'*, University of Durham, UK; Swansea Institute of Higher Education, UK; 'Keele University, UK. Learning, Media and Technology 32.3 (2007): 213-225.

Gredler, M.E. (2004) *' Learning and Instruction: Theory into practice'* cited in Hall, I. & Higgins (2005), S. *'Primary School students' perceptions of interactive whiteboards'* School of Education, Communication and Language Sciences, University of Newcastle upon Tyne, Newcastle Upon Tyne, UK : 102 -117.

Hall, I. & Higgins (2005), S. *'Primary School students' perceptions of interactive whiteboards'* School of Education, Communication and Language Sciences, University of Newcastle upon Tyne, Newcastle Upon Tyne, UK : 102 -117.

Harris S. & Kington A. (2002) *'Innovative classroom practices using ICT in England'* The National Foundation for Educational Research, Slough, Berkshire, England.

Harrison, C., Comber, C., Fisher, T., et al (2002) cited in Higgins, S., Beauchamp G. and Miller D. (2007) *'Reviewing the literature on interactive whiteboards'*, University of Durham, UK; Swansea Institute of Higher Education, UK; 'Keele University, UK. Learning, Media and Technology 32.3 (2007): 213-225.

Higgins, S., Beauchamp G. and Miller D. (2007) *'Reviewing the literature on interactive whiteboards'*, University of Durham, UK; Swansea Institute of Higher Education, UK; 'Keele University, UK. Learning, Media and Technology 32.3 (2007): 213-225.

IFTU (2000) *'Towards 2010, Teacher Education in Ireland over the next decade: Proceedings of the Irish Federation of University of Teachers Conference'* 22/23 October 1999, TCD Dublin IFTU.

Irish National Teachers Organisation: INTO's *'Intouch magazine'* (Issue 82 Jan/Feb 2007, 47-51).

Kemmis, S. and McTaggart, R (eds) (1988) *The Action Research Planner* (second edition) in Cohen, L., Manion, L. and Morrison K. (2011) *'Research Methods in Education'* 7th Edition, Routledge Taylor & Francis Group, London and New York.

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'* (3rd edition) in Cohen, L., Manion, L. and Morrison K. (2011) *'Research Methods in Education'* 7th Edition, Routledge Taylor & Francis Group, London and New York.

Knight, P., Pennant, J. and Piggott, J. (2004) cited in Higgins, S., Beauchamp G. and Miller D. (2007) *'Reviewing the literature on interactive whiteboards'*, University of Durham, UK; Swansea Institute of Higher Education, UK; 'Keele University, UK. Learning, Media and Technology 32.3 (2007): 213-225.

Latane, B. (2002) *'Teaching and learning Primary mathematics: the impact of interactive whiteboards'* in Higgins, S., Beauchamp G. and Miller D. (2007) *'Reviewing the literature on interactive whiteboards'*, University of Durham, UK; Swansea Institute of Higher Education, UK; 'Keele University, UK. Learning, Media and Technology 32.3 (2007): 213-225.

- Latham P. (2002) '*Teaching and learning primary mathematics: the impact of interactive whiteboards*' [online] <http://www.beam.co.uk/pdfs/RES03.pdf> [accessed 8th January 2013].
- Lee M. & Boyle M. (2003) '*The educational effects and implications of the interactive whiteboard strategy of Richardson primary school: a brief review*', Available at: http://www.richardsonps.act.edu.au/RichardsonReview_Grey.pdf [accessed 22nd March 2013].
- Lee J. (2004) '*A whiteboard smokescreen?*' [online] http://www.tes.co.uk/search/story/?story_id=2055677 [accessed 16th February 2013].
- Lemke, C. and Fadel, C, (2006) '*Technology in Schools: What research says*'.
- Levy P. (2002) '*Interactive whiteboards in learning and teaching in two Sheffield schools: a developmental study*'. Department of Information Studies, University of Sheffield, Sheffield, England.
- Lewis, S. (2009) '*So you want to buy an Interactive whiteboards*' [online] available: <http://www.anseo.net/so-you-want-to-buy-an-interactive-whiteboard/> [accessed 5th January 2013].
- Lewis, S. (2012) '*Interactive Whiteboards update*' [online] available: <http://www.anseo.net/international-study-of-interactive-whiteboards/> [accessed 11th May 2013].
- McCormick, R. and Scrimshaw, P. (2001) '*Information and communications technology, knowledge and pedagogy*', Education, Communication and Information in Higgins, S., Beauchamp G. and Miller D. (2007) '*Reviewing the literature on interactive whiteboards*', University of Durham, UK; Swansea Institute of Higher Education, UK; 'Keele University, UK. Learning, Media and Technology 32.3 (2007): 213-225.
- McKeown, T. (2008) '*The Primary Times Guide to Interactive Whiteboards*' in *Primary Times*, Dublin: Primary Times 8.
- Miller, D. & Glover, D. (2002) "*The interactive whiteboard as a force for pedagogic change: the experience of five elementary schools in an English authority*", 1, 5-19.

Miller, D. (2003), 'Developing interactive whiteboard activity', *micromath* in Higgins, S., Beauchamp G. and Miller D. (2007) 'Reviewing the literature on interactive whiteboards', University of Durham, UK; Swansea Institute of Higher Education, UK; 'Keele University, UK. Learning, Media and Technology 32.3 (2007): 213-225.

Miller, D., Glover. D. and Averis, D. (2004a) 'Matching technology and pedagogy in teaching mathematics' in Higgins, S., Beauchamp G. and Miller D. (2007) 'Reviewing the literature on interactive whiteboards', University of Durham, UK; Swansea Institute of Higher Education, UK; 'Keele University, UK. Learning, Media and Technology 32.3 (2007): 213-225.

Morrison, K. R. B. (1993) 'Planning and Accomplishing School-Centered Evaluation' in Cohen, L., Manion, L. and Morrison K. (2011) 'Research Methods in Education' 7th Edition, Routledge Taylor & Francis Group, London and New York.

Mulkeen, A. (2002), 'Schools for Digital Age' Progress Report 1998-2002: Dublin: NCTE.

Mulkeen A. (2003) 'What can Policy Makers Do to Encourage Integration of Information and Communications Technology?' *Technology, Pedagogy and Education*, 12 (2) 277-293

Retrieved from

<http://www.informaworld.com/smpp/content~db=all~content=a751265760~tab=citations>

[accessed 5th January 2013].

Murray, J. (2004) 'A critical evaluation of the Department of Education and Science initiatives to integrate ICT into the republic of Irelands Primary school curriculum', *The Westminster Institute of Education at Oxford Brookes University*.

National Council for Curriculum Assessment (2007), 'ICT Framework – A structure Approach to ICT in Curriculum and Assessment' Dublin NCCA.

National Centre for Technology in Education (NCTE), (2005) 'Census on ICT infrastructure in schools' retrieved from http://www.ncte.ie/documents/NCTE_2005_Census_on_ICT_Infrastructure_in_Schools.pdf [accessed 3rd November 2012].

National Centre for Technology in Education (NCTE), (2008) 'Interactive Whiteboards Advice Sheet 16' [online] <http://www.ncte.ie/documents/advisesheets/16InteractiveWBsNov08.pdf> [accessed 3rd November 2012].

National Centre for Technology in Education (NCTE), (2010) 'ICT Policy' [online] <http://www.ncte.ie/AbouttheNCTE/ICTPolicy> [accessed 17th November 2012].

O'Grady, D. (2010) 'Interactive Whiteboards: A literature review' [online] http://www.cbiproject.net/DOGrady_LiteratureReview2010.pdf [accessed 11th May 2013]

Papert, S. (1993) 'The Children's Machine: Rethinking School in the Age of the Computer', New York: Basic Books.

Passey D., Rogers C., Machell J., McHugh G. & Allaway D. (2003) 'The Motivational Effect of ICT on Students'. DfES Publications, Annesley, Nottinghamshire, England.

Prensky, M. (2001) *Digital Natives Digital Immigrants* from On the Horizon, MCB University Press, Vol. 9 No. 5, October 2001.

Richardson, A. (2002) 'Effective questioning in teaching mathematics using an interactive whiteboard', Micromath, in Higgins, S., Beauchamp G. and Miller D. (2007) 'Reviewing the literature on interactive whiteboards', University of Durham, UK; Swansea Institute of Higher Education, UK; 'Keele University, UK. Learning, Media and Technology 32.3 (2007): 213-225.

Rosenholtz, S. (1989) *Teachers Workplace: The social organisation of schools* cited in Fullan, M. and Hargreaves A. (1991) *What's worth fighting for in your school?*; Working together for improvement, Open University Press in association with the Ontario Public School Teachers' Federation 70 – 139.

Skinner B.F, (1968), cited in Forrester *The Technology of Teaching*, New York: Appleton-Century-Crofts; source: *Overview of Learning Theories* Forrester & Jantzie, (2000).

Smith H. (2001) *Smartboard evaluation: final report*.

[online] <http://www.kented.org.uk/ngfl/ict/IWB/whiteboards/index.html> [accessed 5th January 2013].

Smith, H. J., 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.

Smith, L. (2008): *An investigation into the effect of a NATE/Becta training programme on the use of interactive whiteboards in teaching and learning in Secondary English* *English in Education*. 42(3), 269-282.

Solvie P.A. (2004) *The digital whiteboard: a tool in early literacy instruction*. *Reading Teacher* 57, 484–487.

Somekh, B. (2007) *Evaluation of the Primary Schools Whiteboard Expansion Project – Summary Report*, Manchester Metropolitan University: BECTA.

Tapscott, D. (1998), *Growing Up Digital: The Rise of the Net Generation* available: http://www.ncsu.edu/meridian/jan98/feat_6/digital.html [accessed 6th January 2013].

Türel, Y. K. (2010). *Developing teachers' utilization of interactive whiteboards*. In D. Gibson & B. Dodge (Eds.), *Proceedings of Society for Information Technology & Teacher Education International Conference 2010*, Chesapeake, VA: AACE. (pp.3049-3054).

Türel, Y. K., & Johnson, T. E. (2012): *Teachers' Belief and Use of Interactive Whiteboards for Teaching and Learning*. *Educational Technology & Society*, 15 (1), 381–394.

Watts, M. and Ebbutt, D. (1987) *'More than the sum of the parts: research methods in group interviewing'* in Cohen, L., Manion, L. and Morrison K. (2011) *'Research Methods in Education'* 7th Edition, Routledge Taylor & Francis Group, London and New York.

Wikipedia (2013) Intrinsic Motivation [online]
available:http://en.wikipedia.org/wiki/Intrinsic_motivation#Intrinsic_motivation [accessed 8th December 2012].

Wilson, N and McLean, S. (1994) *'Questionnaire Design: A Practical Introduction'* in Cohen, L., Manion, L. and Morrison K. (2011) *'Research Methods in Education'* 7th Edition, Routledge Taylor & Francis Group, London and New York.

Wood, R. and Ashfield, J. (2007) cited in Higgins, S., Beauchamp G. and Miller D. (2007) *'Reviewing the literature on interactive whiteboards'*, University of Durham, UK; Swansea Institute of Higher Education, UK; 'Keele University, UK. Learning, Media and Technology 32.3 (2007): 213-225.

Yin, R. K. (2009) *'Case Study Research: Design and Methods'* (fourth edition) in Cohen, L., Manion, L. and Morrison K. (2011) *'Research Methods in Education'* 7th Edition, Routledge Taylor & Francis Group, London and New York.

List of Appendices

Appendix A: Letter requesting permission from Board of Management.

Appendix B: Information letter to Teachers

Appendix C: Information and Permission letter to parents

Appendix D: Information letter to Focus Group Teachers

Appendix E: Teacher Attitude to IWB Questionnaire

Appendix F: Student Attitude to IWB Survey

Appendix G: Pre/Post Test

Appendix H: Lesson Plan for Control Group Teacher

Appendix I: Lesson Plan for Experimental Group Teacher

Appendix J: Focus Group Interview Transcript

Appendix K: Observational Field Notes

Appendix L: Pictures of Children using The IWB

Appendix M: Additional Graphical Analysis of Empirical Data

Appendix A: Letter requesting permission from Board of Management.

Dear Chairperson and Principal,

This year I am embarking on my masters in Digital Media for Education. As we are fortunate to have the interactive whiteboards (IWBs) I am going to base my thesis around them.

I am requesting permission to conduct small scale research on the use of Interactive whiteboard in the school and its effects on motivation and student learning.

Areas that I will refer to with permission are:

- Interview with the principal on the benefits of the whiteboard in the school.
- Teacher Questionnaire on use of whiteboard – advantages and disadvantages of this in classroom pedagogy.
- Conduct research on 5th/6th class students to assess both their learning and their opinions of the IWB. Research tools include knowledge test, survey and observations.

I will also request permission from the parents of the classes involved. The school, Teachers and student names will not be used and collection of data will be handled with care. Any recorded material will be stored safely by me and erased on completion of the masters. Ethical issues will be adhered to at all times. Please feel free to contact me should you require any further information.

Thanking you,

Yours sincerely,

Moya Walsh

Appendix B: Information letter to Teachers

Dear Colleagues,

My name is Moya Walsh and I'm a primary school teacher, teaching in [REDACTED] National School County Tipperary. I am currently doing my masters in Digital Media Development for Education.

My research question is

“Is there a link between Interactive Whiteboard use and increased student motivation for learning?”

I would like to collect data for my research study from schools in North Tipperary and would appreciate your help. I would be very grateful if you could complete a questionnaire. I am looking for feedback from you regarding your opinions of the Interactive Whiteboard; ways you use it and your views of it as a teaching and learning tool. The link to questionnaire is <http://kwiksurveys.com/app/rendersurvey.asp?sid=22f6ocf0yba4lop104735&refer=> I can distribute hardcopies on request to your school also. I would be grateful if you could have it completed by Friday the 22nd of March. Please be aware that no matter how much or little you use the board your thoughts and opinions will be of benefit and all feedback will be much appreciated.

Your school or Teachers names will not be used and collection of data will be handled with care. Ethical issues will be adhered to at all times. Please feel free to contact me should you require any further information.

Thank you for your support and time,

Yours sincerely,

Moya Walsh

[REDACTED]

Appendix C: Information and Permission letter to parents

Dear Parents/Guardians

This year I am embarking on my Masters in Digital Media Development for Education through the University of Limerick.

In order to conduct this research I am requesting your help. I would like to get the children's opinions on the Interactive Whiteboards (IWBs). I would also like to assess their learning and observe any motivational benefits of the Interactive Whiteboards. Children of 4th classes will be taught content using the Interactive Whiteboard and I will assess their learning through a knowledge test. I will also ask that the children fill out a survey on IWBs.

In the research children's names will not be used and all research will be handled with care and sensitivity. If you have any question or concerns feel free to contact me.

I would be grateful if you could fill out the consent form and return it to the school by Thursday 14th of March.

Thanking you for your support,

Yours sincerely,

Moya Walsh

Name of Child: _____

Class: _____

Please tick whether you agree to let your child participate in the research study

Yes

No

Parental/Guardian Signature: _____

Appendix D: Information letter to Focus Group Teachers

Dear Colleagues,

As you are aware I am currently doing my masters in Digital Media Development for Education.

The central aim is to explore the thesis question:

“Is there a link between Interactive Whiteboard use and increased student motivation for learning?”

I would like to collect data for my research study from schools in North Tipperary and would like to use our school as the base school. To do so I need your help. I would be very grateful if you could complete a questionnaire. I am looking for feedback from you regarding your opinions of the Interactive Whiteboard; ways you use it and your views of it as a teaching a learning tool. The link to questionnaire is

<http://kwiksurveys.com/app/rendersurvey.asp?sid=22f6ocf0yba4lop104735&refer=> and I can distribute hardcopies on request. I would be grateful if you could have it completed by Friday the 22nd of March. I would also like to obtain some of the data through conducting a focus group interview during week of 11th of March, with some of you to further discuss your thoughts on the Interactive Whiteboard.

Please be aware that no matter how much or little you use the board your thoughts and opinions will be of benefit and all feedback will be much appreciated. The school or Teachers names will not be used and collection of data will be handled with care. Ethical issues will be adhered to at all times. Please feel free to contact me should you require any further information.

Thank you for your support and time,

Regards,

Moya Walsh



Appendix E: Teacher Attitude to IWB Questionnaire

Create your own
FREE ONLINE SURVEY

Teacher Attitudes To Interactive Whiteboards

1 Are you male or female?

- Female
- Male

2 How many years are you teaching?

- 1-5
- 5-10
- 10-15
- 15-20
- 20-30
- 30-40

3 What class level do you teach?

- Infants
- 1st/2nd
- 3rd/4th
- 5th/6th

4 Indicate your level of ICT training (tick all that apply)

- ICT Summer Course
- Interactive Whiteboard Training
- Intel Teach to the Future
- EDCL
- Grad Dip in ICT
- Masters in ICT
- Other ICT professional development course

5 How long have you had an Interactive Whiteboard in your classroom?

- 1-4 months
- 4-8 months
- 8-12 months
- 1-2 years
- More than 2 years

- ITouch
 Other

Using the IWB

7 How often do you use the IWB?

- All lessons
 At least once a day
 Occasionally (2/3 times a week)
 Rarely (once a week)
 Never

8 Where do you source materials for teaching with the IWB? (Tick all that apply)

- Internet
 Interactive Software (CDs)
 Whiteboard Software
 Teacher created materials
 Colleague sharing

9 In what ways do you use the IWB? (Tick all that apply)

- Whole class teaching
 Small groups
 With individual Children
 Interactively, student participation

10 Please rate the following statements (tick one answer from each row)

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
All classrooms should have an IWB	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Teachers should share IWB resources more	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The IWB has improved my teaching	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The IWB caters for all learning styles	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
There is a need for better training in IWB use	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Technical problems are common with IWB	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Lesson preparation takes longer with IWB	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
IWB help to increase attention and Motivation in students	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I feel confident using the IWB	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I am reluctant to let the children use the board	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I am using more ICT in my classroom than before	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I receive sufficient technical support in school	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
IWBs promote group work	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
IWB use encourages didactic teaching	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Students standard of work has improved since IWB installation	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

My classroom is more interactive than before	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The IWB makes learning fun	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
IWB support is always on hand	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I feel under pressure to use the IWB	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The novelty of IWBs in class wears off	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Advantages and Disadvantages of the IWB

11 Please rank the advantages of using IWB's in order of importance (1 being most important, 2 the next and so on, with 10 being least important)

- Allows teachers to share and reuse material
- Helps to integrate ICT into curriculum
- Increases student motivation
- Increases lesson pace
- Allows for high levels of interaction
- Children more focused and attentive
- Allows for easy lesson retrieval
- Aids collaborative learning
- Reduces teacher workload
- Accommodates different learning styles

finished sorting?
 skip question?

12 Please rank the disadvantages of using the IWB in order of difficulty (with 1 being the most problematic and 10 being the least)

- Need for regular calibration
- Lack of training
- Light from windows and bulbs causing visibility issues
- Lack of teacher knowledge on effective use
- Lack of resources
- Increased lesson preparation time
- Lack of technical support
- Shadows from projector
- Screen Freezing
- Problems connecting to projector

finished sorting?
 skip question?

Thank you most sincerely for taking time to complete this questionnaire. All the information gathered will be treated in the strictest of confidence and no information will be published which will identify you or your school.

[Finish Survey](#)

Appendix F: Student Attitude to IWB Survey

9/23/13

Survey provided by kwiksurveys.com

[Report Abuse](#)

Page 1 / 1

Create your own
FREE ONLINE SURVEY

Student Attitudes to Interactive Whiteboards (IWBs)

1 Are you a boy or a girl?

- A girl
- A boy

2 Please select your class

- 3rd Class
- 4th Class
- 5th Class
- 6th Class

3 Interactive Whiteboards are used in my class....

- Every lesson
- Most lessons
- Some lessons
- Hardly Ever
- Never

4 Please select the subject/s most taught using the Interactive Whiteboard

- Irish
- English
- Maths
- History
- Geography
- Science
- Music
- Art
- Religion

5 Teachers use the Interactive Whiteboard to....

- Introduce lesson
- Summarise lesson
- teach whole lesson
- teach most of lesson
- Show media clips as part of lesson

6 Please tick one from each row based on your experience of Interactive Whiteboards

	Strongly Agree	Agree	Don't know	Disagree	Strongly Disagree
I enjoy learning with the Interactive Whiteboard	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I will be able to get a good job if I am able to use technology	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I learn many new things when my teacher uses the Interactive Whiteboard	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I believe that teachers teach the same way whether they use the Interactive Whiteboard or not	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I find it easier to remember facts and information when I learn it from the Interactive Whiteboard	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I feel comfortable using the Interactive Whiteboard	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I find it difficult to keep up with my teacher when they use the Interactive Whiteboard	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The interactive Whiteboard makes lessons more interesting.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Students in my class interact with and use the Interactive Whiteboard regularly.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The Interactive whiteboard can be boring sometimes	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I would work harder if my teacher used the Interactive Whiteboard more often.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Some activities could be done much better without the Interactive Whiteboard.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Using the Interactive Whiteboard makes me nervous	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Using the Interactive Whiteboard does not scare me at all.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Using the Interactive Whiteboard can be frustrating sometimes.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Interactive Whiteboards are difficult to use.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Using Interactive Whiteboards makes learning fun.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Technical problems such as screen freeze and pen problems are common.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Lessons from the Interactive Whiteboards take longer than regular lessons.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I believe it is important for me to learn how to use the Interactive Whiteboard.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Appendix G: Pre/Post Test

Answer as many questions as you can about the Continent of Europe

Student Number: _____

1. Is Europe situated in the Northern or Southern Hemisphere?	
2. Europe is a continent; can you name any other continents?	
3. Can you name the ocean that lies to the east of Europe?	
4. What does the EU stand for?	
5. How many countries are there in the European Union?	
6. Which European country is our nearest neighbour?	
7. (a) How many countries share a land border with France?	
(b) Can you name any of them?	



Can you identify the numbered countries?

1. _____

2. _____

3. _____

4. _____

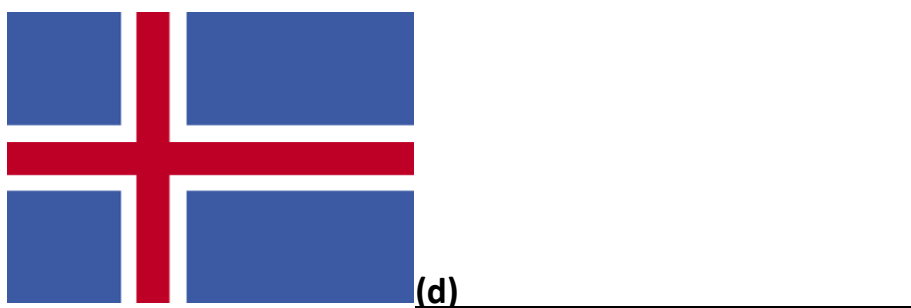
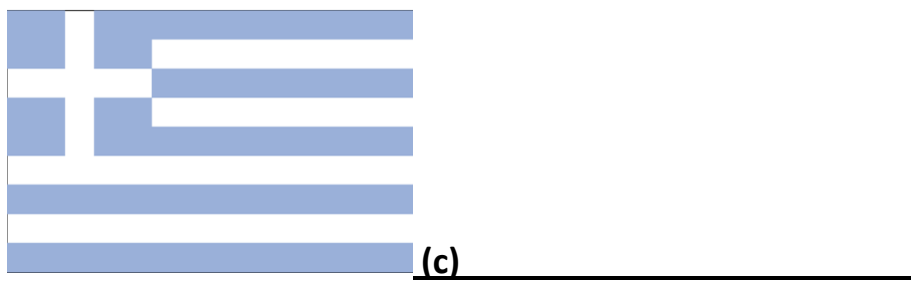
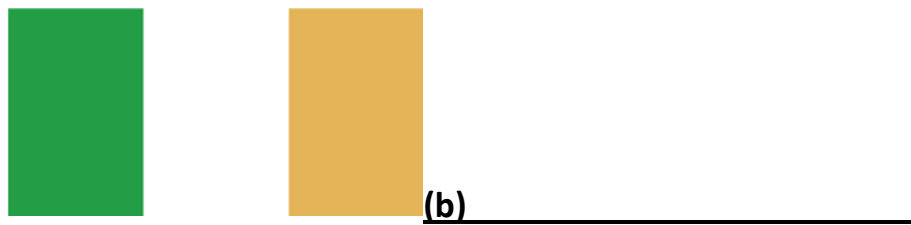
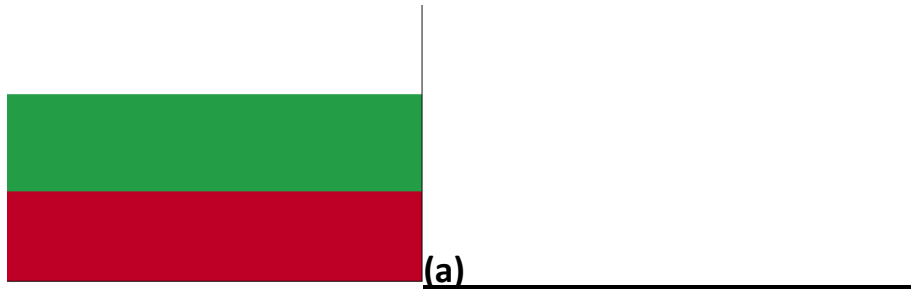
5. _____

6. _____

7. _____

8. _____

Whose flag is this?





(e)



(f)



(g)



(h)

Appendix H: Lesson Plan for Control Teacher

Control Group Lesson Plan on Europe

1 hour lesson

Resources:

Map of World/Globe

Map of Europe

Blackboard/Whiteboard and marker pen

Marker pens and individual whiteboards for true/false session (alternatively students can illustrate answers through a show of hands)

Pictures of country outline (Ireland, United Kingdom, Spain, France, Poland, Greece, Romania and Italy)

Partially labelled map of Europe

16 European country flags

Introduction: (10mins)

Using a globe or map of world, show the global view of Europe. Nominate one student to point out Europe.

Q: Can anyone point out Europe on the globe/map?

Q: What other continents can you name/see?

List them on the blackboard.

Q: What is Europe's geographical position?

(Answer: Europe is in the northern hemisphere, west of Asia and north of Africa).

Q: What ocean lies to the west of Europe

(Answer: The Atlantic Ocean)

Teacher: Some of the European countries joined together to form an alliance or union called the European Union or EU.

Q: Can anyone tell me how many of the European countries are in the EU?

(Answer is 27)

Q: Can you name any?

(Austria, Belgium, Bulgaria, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Liechtenstein, Lithuania,

Luxemburg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden and United Kingdom).

Ask the children to study the map/globe for a moment (1 min) give the children a whiteboard and marker pen or use a show of hands to enable them to vote on the following statements.

Teacher: Answer true or false to the following statements:

- Europe is in the northern hemisphere (**True**)
- Europe is north of Africa (**True**)
- Europe lies north of the Equator (**True**)
- Europe lies East of Atlantic Ocean (**True**)
- Europe is South of Africa (**False**)
- Europe is in the southern hemisphere (**False**)
- Europe is smaller than Africa (**True**)
- Europe is larger than Asia (**False**)

In pairs ask the students to decide which of following statements best describes Europe

A Europe is in the southern Hemisphere

B Europe is larger the Africa

C Europe lies to the East of Atlantic Ocean (True)

D Europe is larger the Asia

A Europe is in the northern hemisphere (True)

B Europe is south of Africa

C Europe is larger than Asia

D Europe is in the southern hemisphere

Development: (40 mins)

Who are our Neighbours?

Explain that Europe has over 40 countries in all.

Q: Can anyone name some?

Make a list on the board and show country on the map.

Show the children map of Europe with some countries names missing.

Write list of these countries on the board – France, Greece, Ireland, Italy, Poland, Romania, Spain and UK.

Q: Can anyone identify these on the map? Write the correct name on the map once correctly identified.

Show the children outline map of some European countries.

Q: Which country is this?

Can the students identify it on the map of Europe. Can the students name it?

Countries are: Ireland, UK, France, Spain, Italy, Greece, Romania and Poland.

-Country Anagrams

Write the following country anagrams on the board. Can the student's decipher the country names?

DINTEU GKNIMOD – UNITED KINGDOM

NSIAP – SPAIN

NYEGRAM – GERMANY

ACFNER – FRANCE

RNUAKEI – UKRAINE

RGULABAI – BULGARIA

-Ranking countries from largest to smallest:

Some European countries are bigger than others?

Q: Which country is larger Ireland or the UK? (UK)

List the following countries randomly on the board and ask students to study map of Europe for a moment (3 mins)

Q: Can you rank the countries from largest to smallest?

Biggest = no. 1 and smallest = no. 6

1. Ukraine (604 thousand square km)
2. France (543 thousand square km)
3. Spain (505 thousand square km)
4. Germany (357 thousand square km)
5. UK (244 thousand square km)
6. Bulgaria (111 thousand square km)

France

Let's have a look at one European country. Point to France on Map.

Q: Can anyone name this country?

Ireland is an Island, it is surrounded by water. Is France an Island? No.

Q: How many countries share a land border with France?

Answer is 8; Belgium, Germany, Luxembourg, Switzerland, Italy, Andorra, Spain and Monaco.

European Flags

Every country has got a specific flag as their national symbol.

Q: What does the Irish flag look like?

Teacher: We are going to look at some of the flags of Europe. As there are over 40 in all, we will just look at 16 of them today.

Hold up eight of the sixteen flags asking aloud if anyone can identify it. If correctly identified, leave it aside. Show the others again and tell the students the country that each flag belongs to.

Hungary Greece Iceland Slovenia Bulgaria Portugal Sweden Ireland

Give an opportunity to 10 of the children to correctly identify the flags, asking the others to watch and assist if necessary.

Teacher: Now let's add 8 more flags into the pile.

Repeat as above. Give opportunity for remainder of class to name as many flags as they can, looking for help where needed.

Conclusion: (10 mins)

Lesson concludes with quick recap of content.

Q: What is Europe's geographical position?

(Answer: Europe is in the northern hemisphere, west of Asia and north of Africa).

Q: Can anyone tell me how many of the European countries are in the EU?

(Answer is 27)

Q: Can anyone identify these on the map?

– France, Greece, Ireland, Italy, Poland, Romania, Spain and UK.

Q: How many countries share a land border with France? Can you name them?

Answer is 8; Belgium, Germany, Luxembourg, Switzerland, Italy, Andorra, Spain and Monaco

Hold up the 16 flags again and ask the children to call out each country name.

Lesson concluded 😊

Appendix I: Lesson Plan for Experimental Group Teacher

Experimental Group Lesson Plan on Europe

1 hour lesson

Resources:

European Flip chart on IWB

IWB

IWB pen

Interactive Voting devices

Introduction: (10mins)

Notes from notes browser in flip chart

Look at the global view of Europe. Nominate one child to point out Europe.

Ask pupils if they can name/locate other continents. The pen tool can be used to note the names.

Map of world, show the global view of Europe. Nominate one student to point out Europe.

Q: Can anyone point out Europe on the globe/map?

Q: What other continents can you name/see?

List them on the board.

Q: What is Europe's geographical position?

(Answer: Europe is in the northern hemisphere, west of Asia and north of Africa).

Q: What ocean lies to the west of Europe

(Answer: The Atlantic Ocean)

Teacher: Some of the European countries joined together to form an alliance or union called the European Union or EU.

Q: Can anyone tell me how many of the European countries are in the EU?

(Answer is 27)

Q: Can you name any?

(Austria, Belgium, Bulgaria, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Liechtenstein, Lithuania,

Luxemburg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden and United Kingdom).

Ask the children to study the map for a moment (1 min) children using interactive voting device connected to IWB to vote on the following statements.

Teacher: Answer true or false to the following statements:

Notes from browser in flip chart

Look at the statements then use the pen tool to place a tick next to the statements which are true.

Click 'here' to view a map.

Drag the eyes down to check answers.

Use the page reset button to do the activity again.

Click on the Re-start topic button to return to the beginning of this topic.

To return to the main menu, click on the Main menu button.

- Europe is in the northern hemisphere (**True**)
- Europe is north of Africa (**True**)
- Europe lies north of the Equator (**True**)
- Europe lies East of Atlantic Ocean (**True**)
- Europe is South of Africa (**False**)
- Europe is in the southern hemisphere (**False**)
- Europe is smaller than Africa (**True**)
- Europe is larger than Asia (**False**)

Notes from browser in flip chart

Voting Session

Read the question then have pupils use their voting devices to register their answers. Use a show of hands if voting devices are not available.

Click on the Re-start topic button to return to the beginning of this topic.

In pairs ask the students to decide which of following statements best describes Europe

A Europe is in the southern Hemisphere

B Europe is larger the Africa

C Europe lies to the East of Atlantic Ocean (True)

D Europe is larger than Asia

A Europe is in the northern hemisphere (True)

B Europe is south of Africa

C Europe is larger than Asia

D Europe is in the southern hemisphere

Development: (40 mins)

Notes from browser in flip chart

Ask pupils to drag and drop the country names onto the map.

Use the revealer to check answers.

Use the page reset button to do the activity again.

Click on the Re-start topic button to return to the beginning of this topic.

To return to the main menu, click on the Main menu button.

Who are our Neighbours?

Explain that Europe has over 40 countries in all.

Q: Can anyone name some?

Make a list on the board and show country on the map.

Show the children map of Europe with some countries names missing.

Write list of these countries on the board – France, Greece, Ireland, Italy, Poland, Romania, Spain and UK.

Q: Can anyone identify these on the map?

Notes from browser in flip chart

There are 8 countries to position on the map.

Click on the countries box and drag the countries to the correct position on the map.

Ask pupils the names of the countries in red.

Use the revealer to check answers.

Use the page reset button to do the activity again.

Click on the Re-start topic button to return to the beginning of this topic.

To return to the main menu, click on the Main menu button.

Q: Which country is this?

Can the students identify it on the map of Europe. Can the students name it?

Countries are: Ireland, UK, France, Spain, Italy, Greece, Romania and Poland.

-Country Anagrams

Work out the anagrams then use the eyes to check answers.

Write the following country anagrams on the board. Can the student's decipher the country names?

DINTEU GKNIMOD – UNITED KINGDOM

NSIAP – SPAIN

NYEGRAM – GERMANY

ACFNER – FRANCE

RNUAKEI – UKRAINE

RGULABAI – BULGARIA

Drag the names of the countries up and down the line so that the largest is on the top and the smallest is on the bottom.

Use the revealer to check the area of each country.

Use the page reset button to do the activity again.

Click on the Re-start topic button to return to the beginning of this topic.

To return to the main menu, click on the Main menu button.

-Ranking countries form largest to smallest:

Some European countries are bigger than others?

Q: Which country is larger Ireland or the UK? (UK)

List the following countries randomly on the board and ask students to study map of Europe for a moment (3 mins)

Voting Session

Read the question then have pupils use their voting devices to register their answers.

Q: Can you rank the countries from largest to smallest?

Biggest = no. 1 and smallest = no. 6

1. Ukraine (604 thousand square km)

2. France (543 thousand square km)
3. Spain (505 thousand square km)
4. Germany (357 thousand square km)
5. UK (244 thousand square km)
6. Bulgaria (111 thousand square km)

France

Let's have a look at one European country. Point to France on Map.

Q: Can anyone name this country?

Ireland is an Island, it is surrounded by water. Is France an Island? No.

Q: How many countries share a land border with France?

Answer is 8; Belgium, Germany, Luxembourg, Switzerland, Italy, Andorra, Spain and Monaco.

European Flags

Use the 'Flag Cards' to study the flags.

Drag the flags out of the 'flag box' and place them in the correct box.

Use the 'Flag Cards' again to check answers.

Use the page reset button to do the activity again.

Click on the Re-start topic button to return to the beginning of this topic.

To return to the main menu, click on the Main menu button.

Every country has got a specific flag as their national symbol.

Q: What does the Irish flag look like?

Teacher: We are going to look at some of the flags of Europe. As there are over 40 in all, we will just look at 16 of them today.

Give an opportunity to 10 of the children to correctly identify the flags, asking the others to watch and assist if necessary.

Click on the text in the middle of the cog to begin. It will ask you to view a particular flag.

Rotate the cog to view the flag and ask pupils which country the flag belongs to.

Use the pull in to check answers.

Use the page reset button to do the activity again.

Click on the Re-start topic button to return to the beginning of this topic.

To return to the main menu, click on the Main menu button.

Conclusion: (10 mins)

Lesson concludes with quick recap of content.

Q: What is Europe's geographical position?

(Answer: Europe is in the northern hemisphere, west of Asia and north of Africa).

Q: Can anyone tell me how many of the European countries are in the EU?

(Answer is 27)

Q: Can anyone identify these on the map?

– France, Greece, Ireland, Italy, Poland, Romania, Spain and UK.

Q: How many countries share a land border with France? Can you name them?

Answer is 8; Belgium, Germany, Luxembourg, Switzerland, Italy, Andorra, Spain and Monaco

Lesson concluded ☺

Appendix J: Focus Group Interview Transcript

Focus Group Interview transcript

Are you all happy to have Interactive Whiteboards in your classrooms?

All reply: Yes

Has anyone previous experience of Interactive Whiteboards prior to teaching in this school?

Teacher 1: Zero

Teacher 2: In college, as part of our ICT module, we would have had one or two modules on IWBs. They had a specific room with different types of boards and we were given the opportunity to use all the different types. They stated the pros and cons of each type and let us play away with them.

We all have Promethean boards here, would you have used Promethean before?

Teacher 2: I would have used promethean in other schools as part of teaching practice; it would be the most common. The Ebeam is also another IWB which seems to be common. But as they stated in college, the pens can cause difficulties. You have different coloured pens along the front and they have a habit of getting lost! They can get lost so easily and get mixed up too.

As regards training, we all received training when boards were installed.

Teacher 3: We only got about one day though, well not even a full day.

Teacher 2: We attended a further days training last year too. We went into Education Centre.

Teacher 3: Oh yes, but remember it didn't even function properly when we went in there, remember. They were showing us the response boards and they couldn't get them to work!

Teacher 2: Oh they were trying to get teachers interested in buying response boards, or at least showing how to use them. It's for class voting.

Oh yes I've seen them, children can respond from their seats and interact with the Whiteboard without having to move. Do you think they are a good idea?

All: Yes, if you were sure they would work!

So regarding training, you've all just received initial training plus one in-service day. Is that correct?

All: Yes

Would you like further training? Do you think it's needed in the school?

All: Yes

At the moment are ye self –teaching or have ye looked for further training?

Teacher 4: Self teaching I suppose or sticking with what you know.

Teacher 1: I suppose from playing around with it helps you to familiarise yourself with what it can do. But you have to give it the time really..

Teacher 5: And learning from each other. For me, being a learning support teacher and moving into different classes, I learn from watching the other teachers and asking them.

Yes collaboration that’s a good point. Do you think you could collaborate more as a staff? Would that help?

All: Yes definitely.

Teacher 5: Definitely find I go to more technically minded teachers for help if I needed assistance or had a query. We all could learn more from each other.

Speaking of technical issues...this is an area that was highlighted in the teacher questionnaire’s that was an issue at times. Have you any thoughts on this? Are there any persistent technical issues with any of you?

Teacher 1: Yes, with mine. When I turn off everything in the evening, I have issues with connectivity the following morning. I find that on shutting down the computer it can take an age to get interactivity again. I might have to shut it down again 2 or 3 times before the interactivity aspect will work again. Between turning it off and trying again, getting a bulb to cool down and waiting. And that’s just a nuisance.

Teacher 6: Especially if you have a class waiting.

Teacher 1: Oh you can’t afford to have a class waiting

Teacher 6: Yes I too find persistent problems in particular with the interactivity of the pen it just doesn’t connect to the board. It means again usually having to shut down and restart but again that doesn’t always work and when you have a class waiting, you’re messing with it for a while, you just end up abandoning it.

Others nod in agreement.

Teacher 6: I don’t know if that’s the right thing to do or not. Maybe I should just say hang on a minute when this happens later on at a time when no one is there I should figure this out? It is all down to time like...

Teacher 2: But they seem to be those problems, even though they can be persistent they seem to be solved by turn it off and turn it back on again (laughs) however technical that is?

Teacher 1: Oh that can be it all you need to do.

Teacher 2: I would find that when my computer goes to sleep (maybe it's more a computer issue) I would lose connection. You know you would get the screen and then it would be looking for different computers, then you get the computer, scart 1 and you almost have to turn everything off to get the two of them back connected again.

Teacher 1: Maybe lose the sleep mode.

Teacher 2: Well sometimes all you have to do is tap and it wakes up and it's connected but sometimes it loses the connection with the computer and I just get the blue screen.

So regarding confidence, do you feel you're confident enough to deal with any technical issue? Do you feel confident with the board?

All: No

Right that brings us back to training again, maybe that's something that should be dealt with when getting training.

All agree.

Regarding resources, do you find it easy to access resources to use with the board?

Teacher 1: What I find is that you could be trawling for an age to get, if you're looking for a lesson, you could find a number of lessons and some of them are absolute rubbish, there is a lot of trawling to be done before you find one that's worthwhile.

Teacher 5: Its very time consuming.

Teacher 1: Yes it is time consuming. I suppose that's where collaboration could come in

All: agree

Teacher 1: If someone knows of a good resource, or where to find them.

Teacher 6: Yes, to share within the staff.

Teacher 1: That, or if there was a forum where other schools could share too.

All agree.

Teacher 3: I mainly use things that I see mentioned in the Intouch magazine.

Teacher 6: Yes, they always have a section on ICT in classroom and mention resources, it can be good.

Teacher 1: Enchanted learning is good for younger classes. Scoilnet has theme pages that can be good too.

Teacher 2: There's ABC village and Starfall

Teacher 5: Yes starfall is good especially for the lower levels.

Teacher 6: Kent primary school has a page devoted to every subject on the curriculum and there are loads of good resources for all class levels on it.

Teacher 2: I think it might be a good idea to find a way of sharing these, whether it's a shared email or notice board.

There is also promethean planet which is linked with Promethean boards do any of you use that?

Teacher 1: Yes, not enough though.

Teacher 2: It seems complicated enough though trying to find things on it and as you say you could be searching a while. I find anything decent you find you often have to pay for too.

Teacher 6: Yes there is the cost element there as well.

So collaboration is definitely something as a staff to discuss...

Teacher 1: Between staff and I suppose if we could talk to staff of other schools too. I could collaborate with other staff teaching at the same level

Teacher 2: I suppose utilising the program as well. Not just using it as a whiteboard. I found that part of the training good the day we went in and they showed us how to use what's comes as part of the board, the software.

Teacher 5: Oh she had amazing ideas

Teacher 2: I suppose I find I just go for PowerPoint to make anything or to create anything myself.

Teacher 5: Yeah, same here

Teacher 2: I don't use the flipcharts at all.

So you import the PowerPoint to the active Inspire software?

Teacher 2: No, I just create PowerPoint and display on the big screen; I should do that and use the software. I'm not utilising it to its potential, picking up a few bits and pieces but I suppose it could be utilised a lot more.

Does anyone think, any of the tools on active inspire are particularly good or useful?

Teacher 1: The maths ones are excellent

All agree

Teacher 1: Shape, circle, using protractors, angles, symmetry things like that its fabulous for that, time...

So maths in particular, is there any other areas? Any tool you might say ‘Oh, that’s on the board, I’ll use it…

Teacher 2: Literacy is good, for infants they have a writing tool a writing frame which is excellent. It can be used to introduce the letters and work with them. A little reveal tool, to model the writing. There are very good tools on it to aid with writing and developing writing skills with infants.

Teacher 6: Yeah even the pre lined pages, handy things like that.

As regards motivating the students, do you feel they are good for motivating them to learn?

Teacher 1: They are yeah, I feel like I’m contracting myself though I don’t use it enough. I know I have geography software that I’ve used on the IWB and it teaches the geography of Ireland, mountains, rivers etc. and they absolutely loved it.

Teacher 6: Is that ‘Know your Ireland’?

Teacher 1: Yes.. they loved testing themselves on it, trying to beat previous scores.

Teacher 6: Yeah, my daughter used ‘Know your Ireland’ software on their IWB at school and she loved it too. She wanted me to get it on my laptop to play with it at home. The interactive element is great and she really enjoyed the learning experience. Doing the tests and again as you said trying to beat her score. While driving home from Dublin she said, “I didn’t realise we drove through Meath, I recognise the town names from the geography game!” She really does know her Ireland!

Teacher 1: It certainly does motivate…

Teacher 2: Yeah, any little thing; even changing the colour of the pen, they all perk up to it!

Yeah

So do you think the children enjoy lessons from the IWB?

All: Yes!

They obviously like interacting with the board and you believe it motivates them further so in general do you let them interact with the board?

Teacher: Not really

Teacher 1: I was better last year, there’s no specific reason why I just was. But I haven’t as much this year

Teacher 1: It’s great to see them. I subbed at a school last year and the children were very familiar with the board, the 2nd class students took out the laptop every morning and set up the interactive whiteboard. They used it a lot. The infants used it as part of their play session

in the morning. They all interact with it, drawing. One of them was showing me where to find things!

Teacher 6: Yeah when I had infants last year I had it as one of the stations in the play session. The children loved it, they were always asking ‘when is it my go?’ They know how to use the pen and tools. They would find tools you didn’t know were there!

As part of lessons though, do the children get an opportunity to interact with the board?

Teacher 5: Very motivated. I see when I come in for Maths lessons. They are mad to go to the board. Using the pen to make a set or just draw something.

Are all the children focused though or is it just the child at the board?

Teacher 2: No, Oh definitely they all feel it’s a group effort assisting the one at the board and watching. In English we were doing connecting words such as can and not and all of them were still calling out and being part of the lesson not just the child at the board. They were coming up with other words like on and to and so on.

To teacher 1: Just to go back to something you said earlier I don’t use it enough I don’t know why because when you do you feel it motivates?

Teacher 1: Yes it does

So do you think if you used it more often it would lose that? Is it just a novelty factor? Will it wear off?

Teacher 2: No I don’t think so, because there are so many facets to it. A blackboard is just a blackboard, you can write on it, you can draw on it and that’s it, whereas, with the IWB you can do so much more. You can pull so much in, you can have your internet, your PowerPoint you’ve games, pictures...

Teacher 1: You’ve sound...

Teacher 6: Yes and it’s something that’s changing all the time, the multimedia aspect of it, so they won’t bore of that...

Teacher 2: Yes there are so much more facets to it. It’s what they are interested in so you draw them to it. I used an interactive game for learning tables last year, they all had little racing cars and loved it. It made learning tables fun.

Teacher 3: Yes it’s something you couldn’t replicate without the board.

Teacher 5: Yes it saves a lot of time too in one sense. Before you would have been making things to draw in the students to keep them interested, now it’s there. I suppose it takes time to find it and make it too though.

Teacher 6: Yes you can find a certain amount of it ready prepared lessons on teacher websites.

Compared to time spent preparing for traditional taught lesson would it take longer?

Teacher 1: It can, there are more options. Checking what's available what else you could add, there are so many options this can take time.

Teacher 2: Yeah making a traditional lesson you almost limit yourself.

Teacher 1: With a hard copy, you know what you're doing and there is only so much you can do. So unless you are really focused there is a danger of wasting a lot of time.

One of the features of the IWB is save and reuse facility though, do many of ye utilise this feature.

Teacher 3: Yes I would often save things I've made to look at again.

Teacher 6: Yeah you can have a pool of resources then to look back on and use again next year.

Going back to the questionnaire, many teachers have said they use the board for whole class teaching. Do you think there is a danger of the lessons becoming more didactic in nature, teacher led rather than student led?

Teacher 2: To make lessons interactive takes a huge amount of time, you need to be so much more prepared and I suppose yes I could see how lessons can become didactic if that prep isn't put into them.

Teacher 4: Yes there is a danger of it.

Teacher 5: I suppose as long as you are aware of this and at times add in paired and group work to your lesson to avoid this.

Teacher 2: Giving them choices and ownership of the lesson is important and where you prepare a lesson with this in mind it can take longer adding in different elements for interactivity etc.

The Primary Curriculum states that students should learn about and through ICT. Do you feel the children are leaning with and about ICT through having IWBs?

All: They know a lot from home

Teacher 2: Yeah they do but as you said (teacher 6) your daughter brought what she learned in school home too. It works both ways.

Teacher 6: Yeah they do know a lot and know already how to use the computer, as you mentioned about the children in school you subbed in, they are not afraid of it but they can learn lots from interactive lessons at school. The interactive games for learning tables mentioned earlier and other games can make learning fun and are definitely learning with ICT.

Ok I want to thank you all for your presence and input here today you've been great. It's much appreciated. Just to finish would anyone like to add anything further, comment on anything that was discussed today?

Teacher 1: I appreciate that I've a powerful tool in my room that I'm not making the most of and maybe that is something that we/I should start changing.

All nod in agreement...

Meeting concluded 😊

Appendix K: Observational Field Notes

Observations from Control Group Class Teacher

I would say that the class certainly appeared actively engaged with the activity. There were lots of questions asked and answers offered and they seemed to enjoy it. The subject matter was of great interest to one particular pupil. He loves everything to do with maps and flags. The rest of the class were eager to see how much he knew and some to see if he would get anything wrong, (he didn't).

The class like to be up and about doing activities as opposed to being passive receivers of information. They especially enjoy any activity that has a competitive edge. For these reasons I would say that they definitely enjoyed the activity.

Observations from IWB lessons

When observing student use of IWB the researcher noted the following:

- High levels of interest and enjoyment from the students in particular in the junior end of the school.
- The students wanted to interact with the board and were fully engaged with the lessons.
- 100% of students in infant room and 1st/2nd classes had their hands up to participate at all opportunities. Levels of disappointment in students who did not *get a go* were palpable.
- Students of middle and senior end also had high levels of attention with an average of 75% of students observed raising hands to participate at all opportunities.

Observed reactions to IWB use in Infant Classroom

'Will everyone get a go?'

'I love this game'

'Can we do that again?'

'I never get a go'

Observed reactions to IWB use in 1st & 2nd Classroom

'Yay! It's our go!'

All clapped when selected students got the right answer. All hands up to participate. All interested and keeping track of results of maths game, how many correct answers.

Researcher noted comments on technical issues.

'The pen is a bit wonky!'

'Sometimes the pen doesn't work, it's annoying'

'You could use the mouse if you want instead'

Observed reactions to IWB use in 3rd class

All focused on interactive activity, good to take turns and encourage each other.

We didn't get to play that; can we do the caterpillar number game next time?

When the screen freezes you have to turn it off then on again

YESI love twenty questions

Observed reactions from 4th class

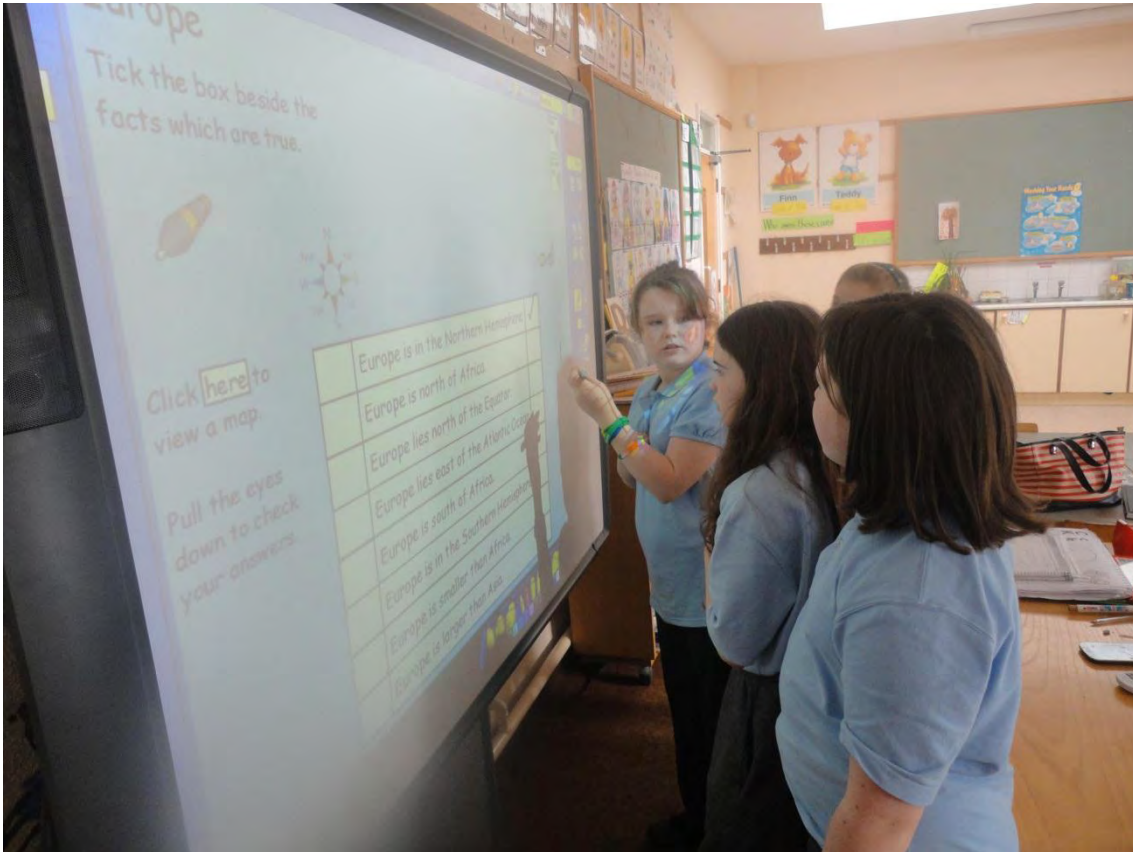
Can I move? There is a shine (glare) on the board.

During the whole class session the majority of students were engaged. Students enjoyed interactive game with a competitive element where students competed against the clock.

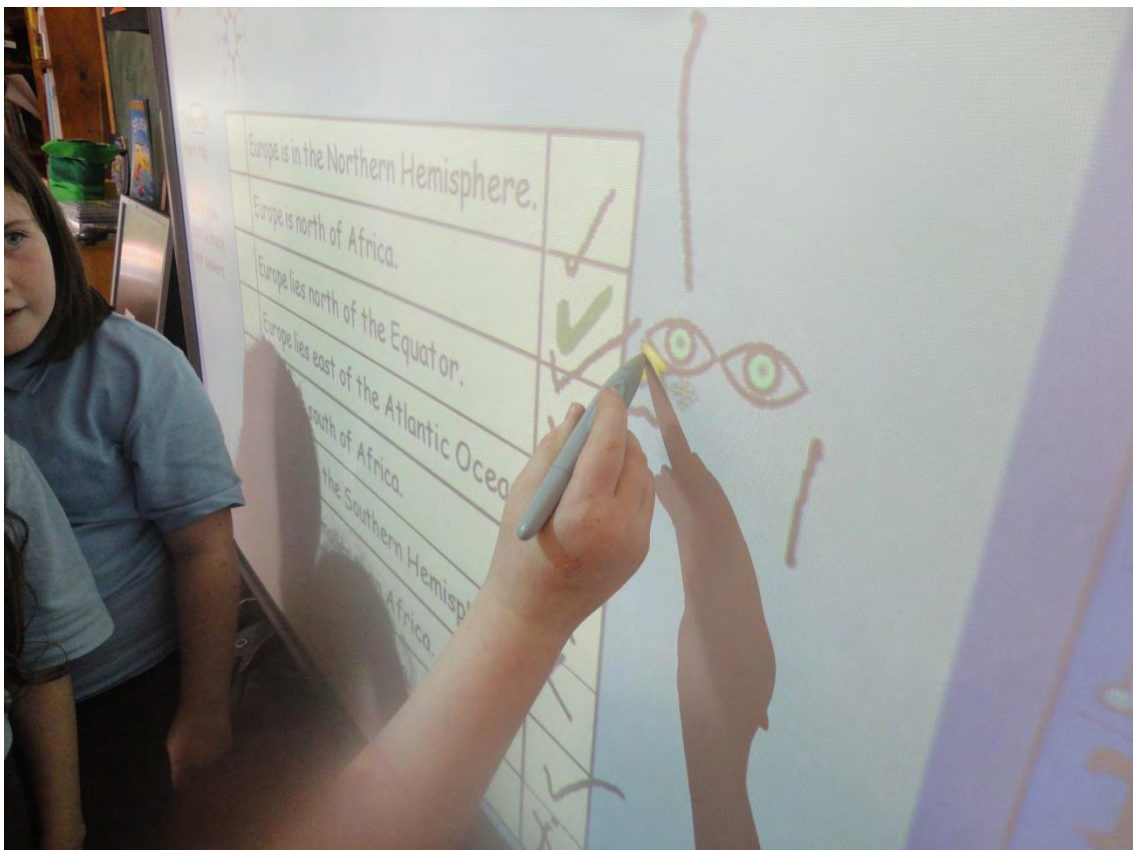
Observed reactions from 5th & 6th classroom

Students seem to enjoy lesson. High level of enjoyment noted with the collaborative group activity. Students worked well and participation was high.

Appendix L: Pictures of Children using The IWB



Experimental Group Students working on Interactive Whiteboard





Students working on map activity





Students working on flag quiz



Appendix M: Additional Graphical Analysis of Empirical Data

Student	CG Pre test	EG Pre Test	CG Post Test	EG Post Test	CG % Increase	EG % Increase
1	42%	13%	71%	22%	29%	9%
2	38%	16%	Absent	71%	0%	55%
3	45%	39%	65%	52%	20%	13%
4	42%	65%	90%	77%	48%	12%
5	26%	55%	51%	68%	25%	13%
6	22%	35%	45%	87%	23%	52%
7	16%	77%	48%	87%	32%	10%
8	16%	48%	35%	93%	19%	45%
9	26%	77%	61%	87%	35%	10%
10	22%	61%	35%	65%	13%	4%
11	29%	48%	61%	84%	32%	36%
12	42%	65%	Absent	74%	0%	9%
13	87%	42%	96%	65%	9%	23%
14	61%	29%	80%	80%	19%	51%
15	22%	45%	71%	90%	48%	45%
16	10%	48%	32%	77%	22%	29%
17	32%	42%	55%	68%	23%	26%
18	32%	13%	48%	55%	48%	42%
19	48%	36%	90%	87%	42%	51%
20	22%	71%	48%	81%	26%	10%
21	48%	52%	93%	78%	41%	26%
22	22%	39%	67%	61%	45%	22%
23	39%	39%	90%	61%	51%	22%
24	29%	48%	65%	77%	34%	29%
25	26%	26%	29%	48%	3%	22%
26	48%	32%	77%	77%	25%	45%
27	29%	35%	55%	77%	24%	42%

Table 4.1: Test Results & Percentage Increase

Test Score % Increase Comparisons

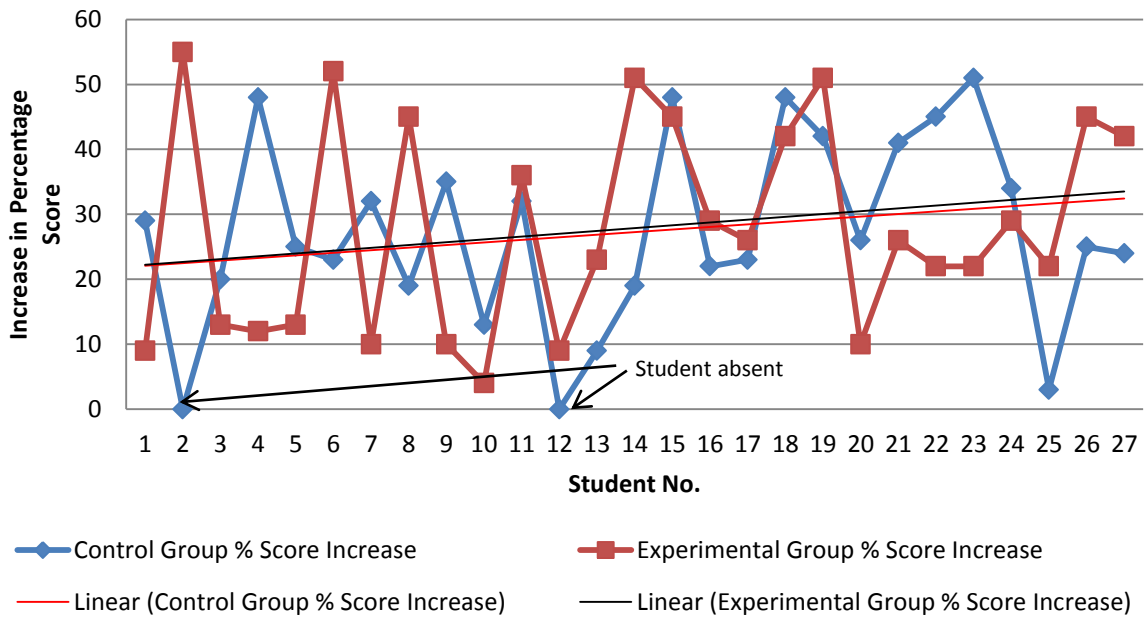


Figure 4.3 Percentage increase Comparison of control and experimental groups

Pre Testing Score Comparisons

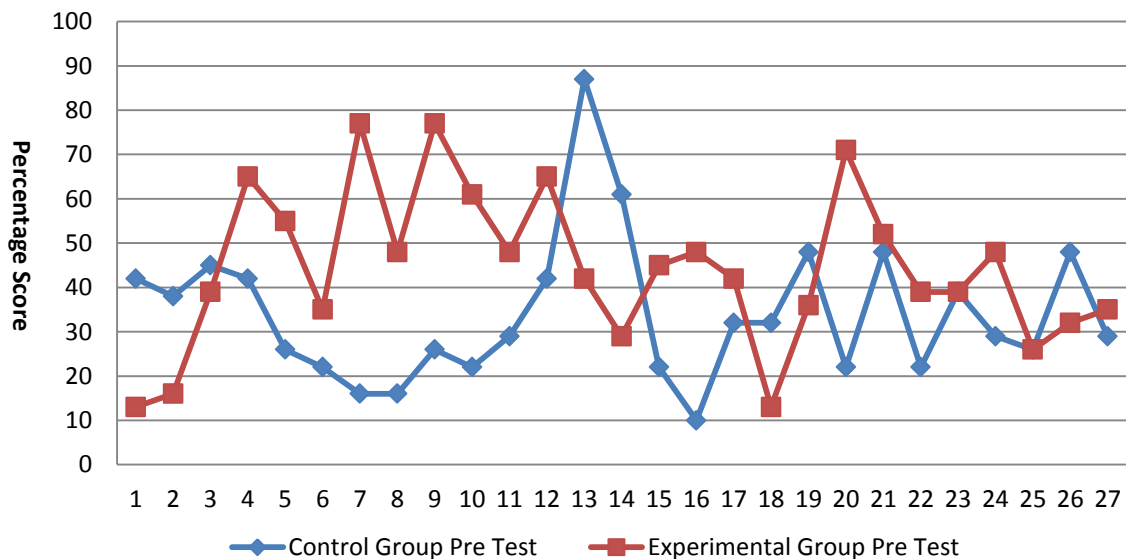


Figure 4.13 Comparisons of Control & Experimental Group Pre Test Results

Post Testing Score Comparisons

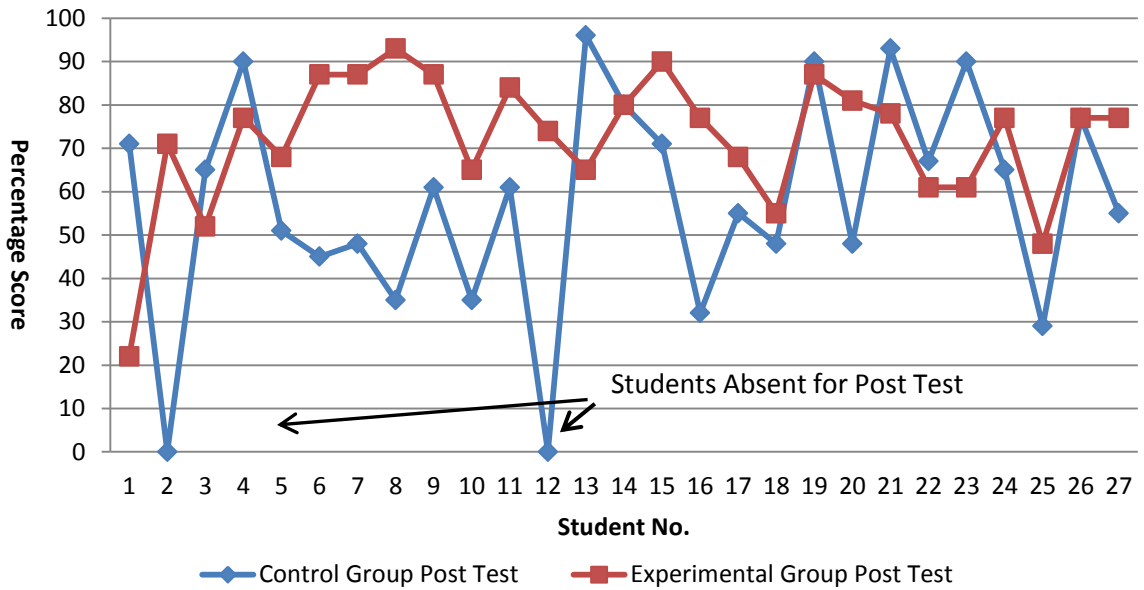


Figure 4.14 Comparisons of Control & Experimental Group Post Test Results

Control Group Pre & Post Comparisons

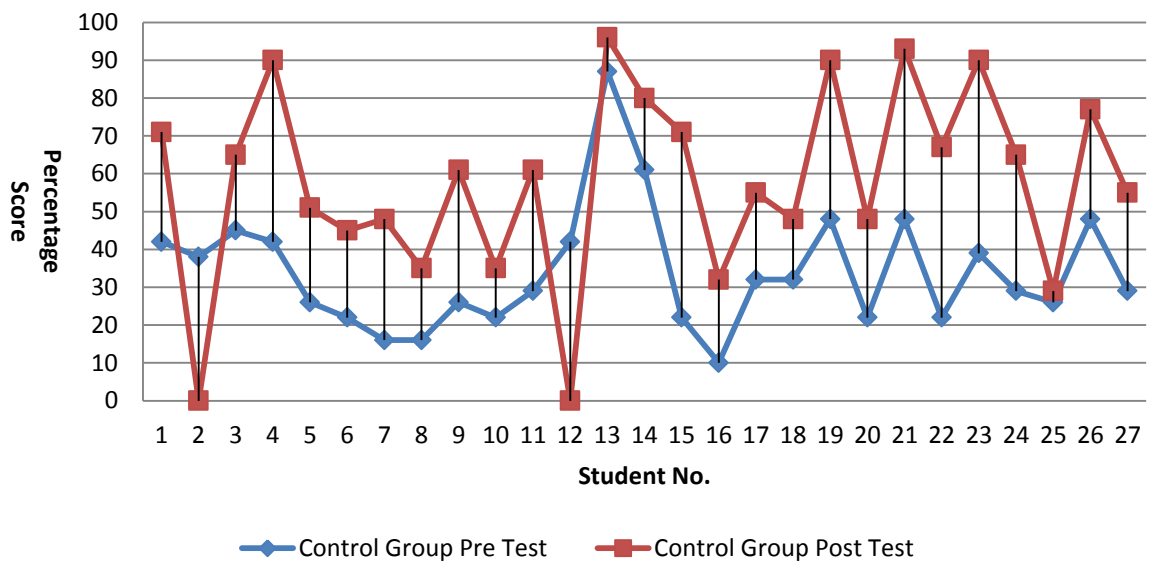


Figure 4.15 Comparison of Control Group Pre & Post Test

Experimental Group Pre & Post Comparisons

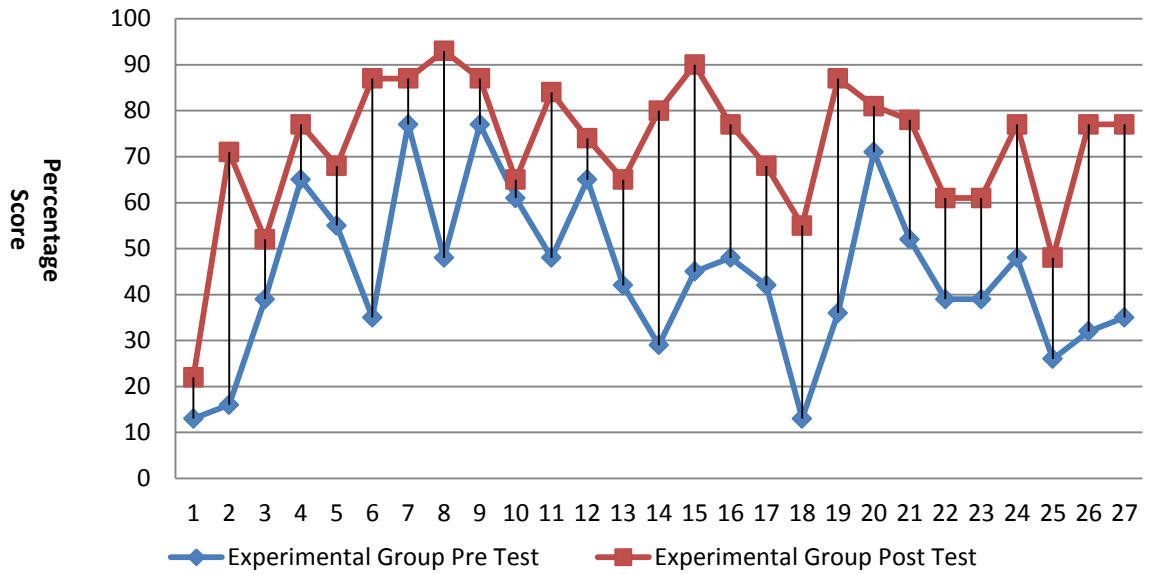


Figure 4.16 Comparison of Experimental Groups Pre & Post Test

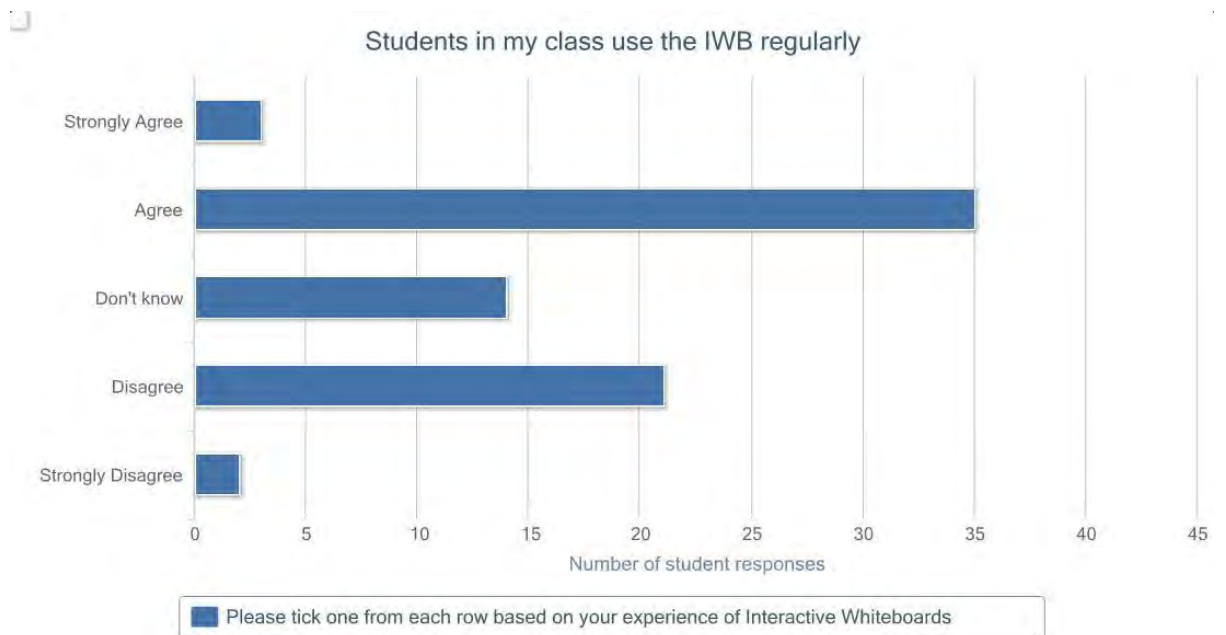


Figure 4.17 Teacher Responses to student use of IWB

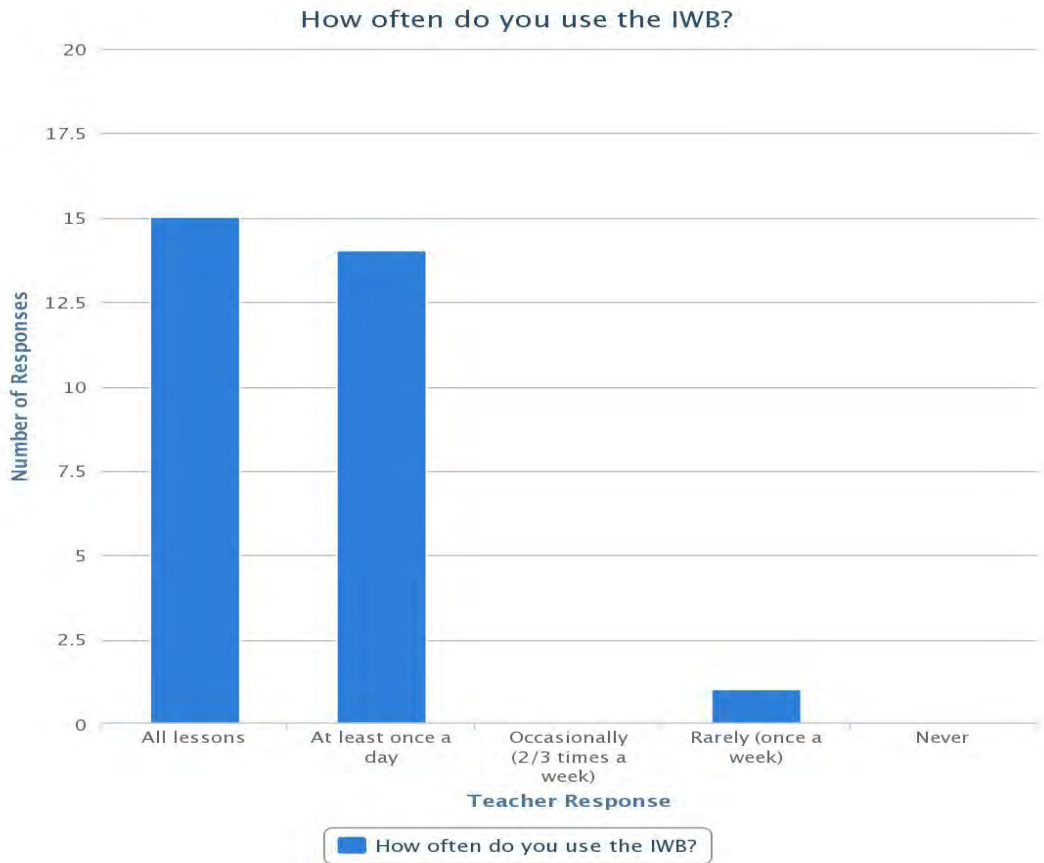


Figure 4.18 Teacher Response to use of IWB

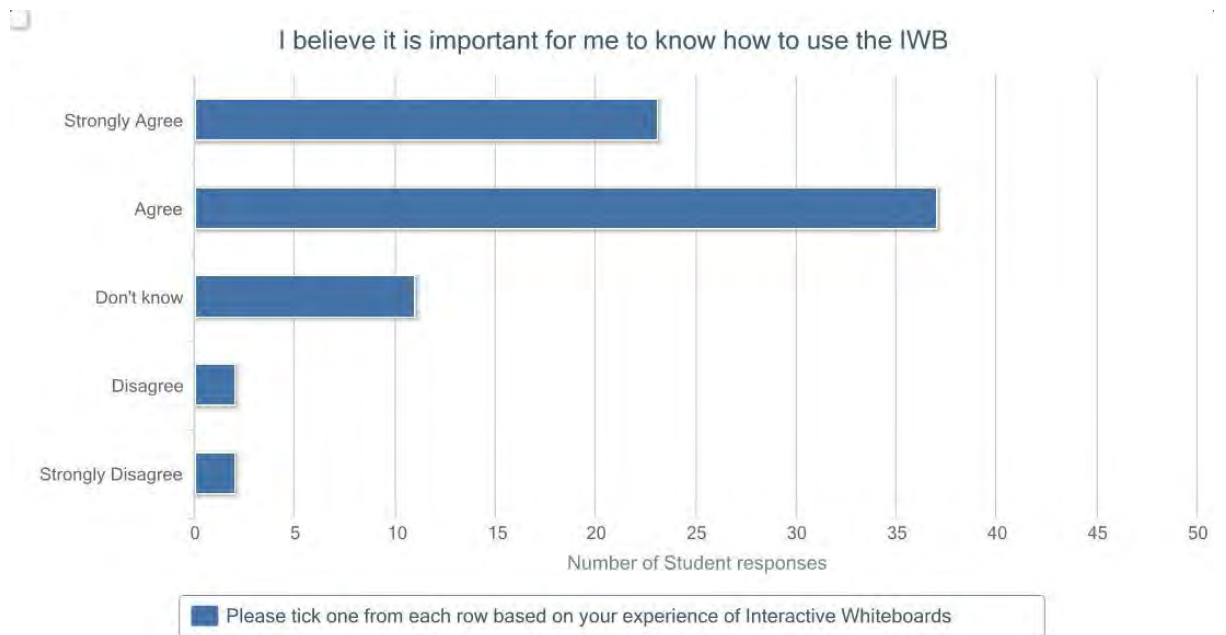


Figure 4.19 Student Response to Importance of IWB use

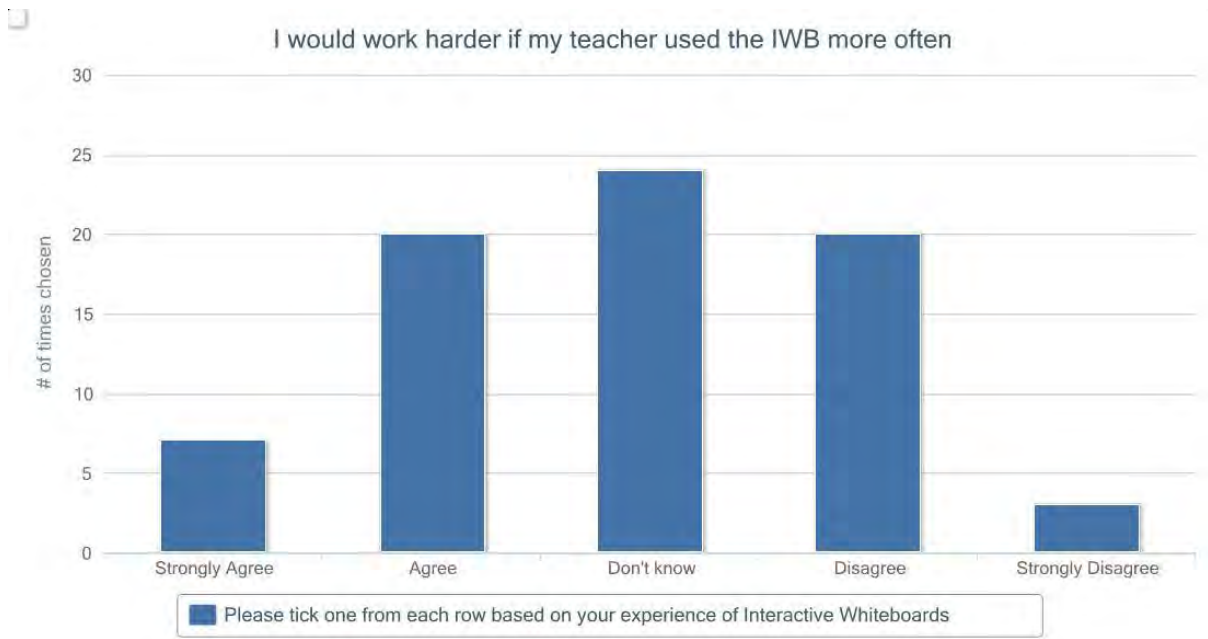


Figure 4.20 Student Responses to Interest in Learning from IWB

I find it easier to remember facts from the IWB (Student Responses)

Strongly Agree Agree Don't Know Disagree Strongly Disagree

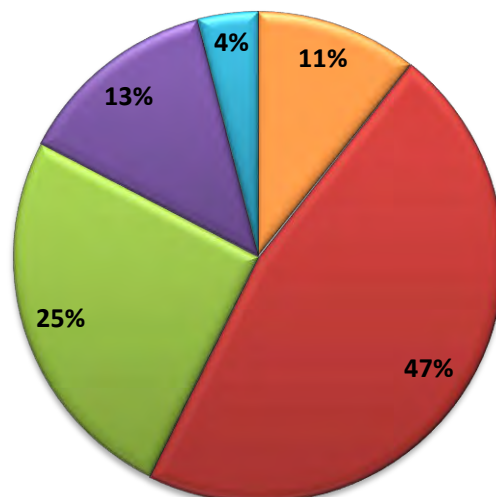


Figure 4.21 Student Responses to Learning with IWB

**IWB Technical Problems such as screen freeze are common
(Student Responses)**

Strongly Agree Agree Don't Know Disagree Strongly Disagree

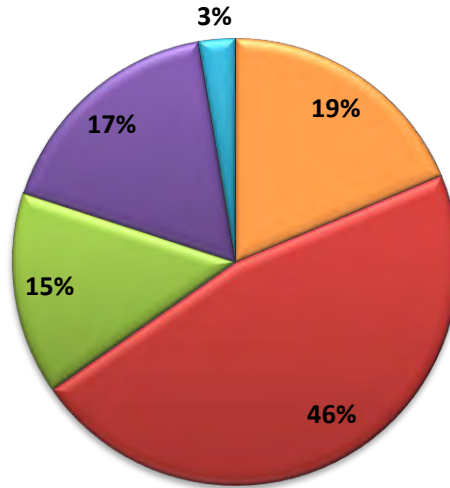


Figure 4.22 Student Responses to IWB Technical Problems