AN EXPLORATION OF HOW INTERACTIVE WHITEBOARD TECHNOLOGY IS BEING UTILISED IN SECONDARY ENGLISH CLASSROOMS

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An exploration of how interactive whiteboard technology is being utilised in secondary English classrooms

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ABSTRACT

This study offers a much-needed discussion of the use of interactive whiteboards in English teaching. Focusing on a sample of teachers, in an English region, it seeks to provide heightened awareness of and critical insight into the role that the technology plays within the teachers’ practice. Specifically and distinctively, it examines how the technology supports the teaching of English skills and content. The study addresses the paucity of research into interactive whiteboard use within this secondary core subject.

The study is informed by a consideration of teachers’ technological pedagogical content knowledge (TPACK) and by two other specific theories. Gibson’s theory of affordances supports a consideration of opportunities offered by the technology. The cognitive theory of multimedia learning (Mayer) underpins an exploration of the multimedia capabilities of interactive whiteboards.

A case study approach is adopted, using mixed methods to gather data on seven case study teachers who are experienced, regular users of the technology. Lessons taught by the teachers were observed through systematic observation and the content of the interactive whiteboards was analysed. The English teachers were subsequently interviewed.

A range of findings illuminate areas relating to interactive whiteboard content, English subject teaching and pedagogy in general. Analysis shows how the teachers are actively considering aspects of planning and design with their resources in particular. They produce highly prepared resources, designed to suit individual teaching groups. However, the technology can be utilised in limited and limiting ways. Program choices constrain the affordances of the interactive whiteboard. Multimedia content is limited in nature. The main pedagogic model is one that supports teacher control and the transmission of content. Student interaction is usually constrained and training opportunities are uncommon. The study identifies the need for a better informed understanding of the technology’s affordances if it is to effectively support English teaching.
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<table>
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<th>Abbreviation</th>
<th>Full Form</th>
</tr>
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<tbody>
<tr>
<td>CLT</td>
<td>Cognitive load theory</td>
</tr>
<tr>
<td>CTML</td>
<td>Cognitive theory of multimedia learning</td>
</tr>
<tr>
<td>CA</td>
<td>Content analysis</td>
</tr>
<tr>
<td>CPD</td>
<td>Continuing professional development</td>
</tr>
<tr>
<td>ENF</td>
<td>Electronic notebook/flipchart</td>
</tr>
<tr>
<td>EAL</td>
<td>English as an additional language</td>
</tr>
<tr>
<td>FSE</td>
<td>Framework for secondary English</td>
</tr>
<tr>
<td>GCSE</td>
<td>General Certificate of Secondary Education</td>
</tr>
<tr>
<td>ICT</td>
<td>Information and communication technology</td>
</tr>
<tr>
<td>IFPD</td>
<td>Interactive flat panel display</td>
</tr>
<tr>
<td>IP</td>
<td>Interactive projector</td>
</tr>
<tr>
<td>IWB</td>
<td>Interactive whiteboard</td>
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<tr>
<td>MFL</td>
<td>Modern foreign languages</td>
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<tr>
<td>NATE</td>
<td>National Association for the Teaching of English</td>
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<tr>
<td>NC</td>
<td>National curriculum</td>
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<td>NLS</td>
<td>National literacy strategy</td>
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<tr>
<td>PC</td>
<td>Personal computer</td>
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<td>Systematic classroom observation</td>
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1 INTRODUCTION

1.1 An introduction to the research and the researcher

This study aims to produce a better understanding of how interactive whiteboards (IWBs) are being used in one secondary curriculum subject: English. English is one of three core subject areas at secondary school. Bodies of study have arisen relating to the other two core subjects of mathematics and science, but the same is not true for English. This current study aims to address this paucity of literature and exploration relating to English and IWBs by examining how IWBs are being used to teach English.

The project is generated from the researcher’s own experiences and interest in using this technology in the English classroom. As a teacher who was given access to an IWB at an early stage of their introduction to UK classrooms, the researcher became an early nationwide trainer in using the technology, receiving recognition of excellent practice through the national ICT in Practice Awards (Becta, 2002). The researcher’s interest and involvement with this technology, then, is acknowledged from the outset. It has necessitated a consciously reflexive approach, particularly in terms of the researcher’s own ‘knowledge’ of the field and her relationships with those teachers being observed. Throughout the study, measures have been taken to recognise and take account of this potential bias, particularly in the choice of case study teachers for exploration.

The questions asked in this study are posed with a view to generating empirical data on how IWBs are used in selected English lessons. The researcher wishes to capture aspects of IWB practice within English lessons, like a camera, and then to pause and reflect on the ‘images’ created. As with a photograph, the picture produced is not the reality and it does not reveal the whole picture, but it does capture aspects of practice and it can provide the opportunity for viewers to reflect on what has been captured.
Experience within this field enables the researcher to approach this study in an informed and confident manner, but it is important to note that the study does not emanate from a desire to promote a particular approach. Rather this study is founded on a genuine desire to better understand the place of IWBs in English teaching. Understanding how a sample of practitioners, experienced with the technology, is actually using IWBs is a starting point to a better overall comprehension of the technology and its relationship with English.

1.2 An introduction to the technology

The interactive whiteboard has subtly changed the landscape of school classrooms. Introduced to UK schools in the late 1990s (Becta, 2008; Betcher and Lee, 2009), in a little over a decade it has become established as a standard piece of technological equipment in most classrooms in the UK (Messenger, 2013). IWBs have attracted proponents and detractors. Claims made for the many benefits of IWBs for teachers, including the transformational effect on teaching (Betcher and Lee, 2009; John and Wheeler, 2008; Becta, 2003), are countered by notes of caution and sceptism about technology taking precedence over pedagogy (Betteney, 2009; Kelley, Underwood, Potter, Hunter and Beveridge, 2007). Reviews of the literature generally indicate that this is a potentially powerful teaching and learning aid, but teachers need to be better prepared in order to use it effectively (Miller and Glover, 2010; Kennewell, 2006; Smith, Higgins, Wall and Miller, 2005).

In essence, an IWB is a touch-sensitive board (typical of the size of traditional static whiteboards) which is connected to a computer and a digital projector. Depending on make, the IWB may be operated by finger, by pen/stylus or by peripherals such as mouse, keyboard and special tablets/slates. Like a digital chameleon, it imitates the functions of existing technologies so that it produces similar effects to the traditional whiteboard, the computer screen and the film screen. This multifunctional capacity of the technology, which enables the IWB to act like a ‘digital hub’ (Betcher and Lee, 2009, p.12), has made the IWB attractive to professionals across all age ranges within the education spectrum (John and Wheeler, 2008, p.45). There are ‘anxieties’ (Barber, Cooper and Meeson, 2007, p.1) about using the technology, for example in the
technical operations (ibid.), but adoption has been widespread and the UK has led the world in terms of IWB adoption (Messenger, 2013).

The spread and increase of the IWB has been regarded as ‘technology-led’ rather than ‘education-led’ (Mercer, 2010, p. xv) meaning that the availability of the technology underpinned its advance: ‘Instead of evidence of their value, there was only political rhetoric about the wonders of new technology, with unsupported claims that IWBs would (and should) transform teaching’ (ibid.). This is partially true. The decision by the UK government of the day to invest approximately £330 million into information and communication technology (ICT) in schools between 2002 and 2005 (Thomas and Schmid, 2010) undoubtedly created a big surge in the numbers of IWBs in school. However, IWBs were already a part of the educational landscape by 2002. One of the first research papers to consider IWBs in education is that of Greiffenhagen who notes that once ‘electronic whiteboards’ (2000, p.1) became affordable in the mid-nineteen-nineties, they started to be used in educational settings. Researchers were beginning to report on the impact of IWBs by 2002, particularly in the primary sector (for example, Burden, 2002; Carter, 2002; Cogill, 2002). The phase of government influence over the rise of the technology from 2003 onwards (Thomas and Schmid, 2010) came after educational interest had already been established in IWBs, albeit fuelled by persuasive and effective marketing by IWB manufacturers (Kenny, 1998). Classroom practitioners had seen ‘something special’ (Mercer, 2010, p.xv) about IWBs, something that allowed them to do many jobs efficiently with one piece of technology. However, the effective utilisation of the technology is dependent upon a thorough understanding of the technology.

1.3 IWBs within English teaching

It is probably true to say that the relationship between English and information and communication technology (ICT) is rather variable, inconsistent and ‘uneasy’ at times (Scarratt and McInnes, 2009) as many practitioners are unsure about the precise role of ICT in English. The National Curriculum (NC) has not given a great deal of assistance
to practitioners. The 2007 version stipulated that Key Stage 3 learners engaged with multimodal and non-linear texts, which might include websites or CD Roms, and also suggested that pupils develop their reading and writing through links beyond the classroom (for example, publishing on the web) (QCA, 2007). The latest version of the NC, to be taught from September 2014, is devoid of reference to ICT in relation to English (DfE, 2013). Indeed the terms ICT, media, multimedia, multimodal or technology do not appear in the NC programme of study for English. However, the subject association for English, the National Association for the Teaching of English (NATE), considers that ‘new technologies can enable the active, vibrant, relevant teaching of English’ (NATE, 2007) thereby supporting ‘motivation, understanding, engagement, analysis and creativity’ within the subject (ibid.). Not only can ICT provide rich English teaching opportunities, but in actuality it is an essential part of young people’s education (Daly, 2011) and teachers ought be supporting learners in two essential ways: providing access to the technology for all and guiding learners into being critical users of digital technologies (Daly, 2011).

NATE raise a number of issues with regard to ICT in English teaching, including insufficient understanding amongst teachers about the nature of ICT in English, a scarcity of effective embedded practice and a lack of prioritisation accorded to ICT in English. In the case of IWBs in English classrooms, this lack of prioritisation for English has also been noted elsewhere. A study examining the introduction of IWBs into the core subjects (English, mathematics, science) in London schools, noted that English were equipped with IWBs after the other subjects (Moss, Jewitt, Levaic, Armstrong, Cardini and Castle, 2007). Moss et al. (2007) consider this may stem from different curriculum areas having different needs, and this may be the case. Equally, subjects may be overlooked and consequently practitioners from all curriculum areas need to understand what IWB use has to offer their subject. The research question underpinning this study is directed at ascertaining a better picture of how IWBs are being used in the sample teachers’ lessons.
1.4 Research rationale and aims

The current body of research on IWB use in secondary English teaching is limited. Studies have been conducted which give consideration to English-teaching uses of the IWB, alongside that of other subjects (for example, Moss et al., 2007). Within these studies the focus tends to be on the use of the technology under broad themes, so that the points of reference between the subjects tend to be generic ones (for example, pace, written texts, multimodality). There have also been IWB studies, specifically focusing on primary literacy (for example, Shenton and Pagett, 2007), as well as explorations of use with post-16 English language teaching (for example, Schmid, 2006). English lessons may be studied as part of the broader study of IWBs on a particular theme, such as interaction and interactivity (for example, Armstrong, Barnes, Sutherland, Curran, Mills and Thompson, 2005) and such studies have pertinent outcomes but again, they are not focussed on the specific needs of the secondary English curriculum. A major rationale behind this study is to extend knowledge and understanding of how IWBs are being used in English teaching and to do so from an English-teaching perspective.

There are a number of broad aims for this study. They are encapsulated with the research question:

How, in terms of user, timing, content and purpose, are IWBs being utilised to teach English by a small number of secondary English teachers who are experienced in using the technology?

This question emphasises that the main focus of this study is English as a secondary school curriculum subject. It examines data from English teachers and English lessons with the aim of generating empirical research and findings on the use of IWBs in English teaching. The main aim of this study, therefore, is to illuminate practice and so enhance our understanding of IWB use within the subject of English. The focus of the study is deliberately on teachers and teaching, as the IWB is currently mainly conceived of as a teaching tool. Learners and learning are considered within this study.
but they are not the main focus. However, further study of learners’ experiences/engagement will be recommended at the end of this study.

The question also specifies that that data will be drawn from practitioners who are experienced in working with IWBs. Whilst a relatively new form of technology, IWBs have been used in some schools for around fifteen years and have been in just over 70% of classrooms since 2008 (Messenger, 2009). The target practitioners for this study are neither new users, who have already been the subject of a number of studies (for example, Miller and Glover, 2007; Moss et al., 2007; Glover and Miller, 2001b) nor ‘missioner’ practitioners who are enthusiastic, champions of the technology (Glover and Miller, 2001a, p.2). Rather, the desire is to consider routine use of the technology. Such an approach will hopefully avoid extremes of practice, and give an indication of how practice is becoming established in the teachers’ classrooms.

Finally, this study investigates how IWBs are being used in key areas within the observed English lesson, namely:

- user – who are the users of IWBs?
- timing – information indicating when IWBs are used and for how long
- content – the type of content used on the IWBs
- purpose – how are the IWBs being used, particularly in terms of English teaching objectives?

Gathering data on these areas, particularly on the content and its purpose, will enhance knowledge about how IWBs contribute to English teaching.

### 1.5 Theoretical threads

This study is informed by a range of concepts and theories, but three are of particular significance:

- the theory of affordances
- cognitive theory of multimedia learning
- technological pedagogical content knowledge (TPACK).
These three theories will run as significant ideas or ‘threads’ through the study.

The term ‘affordance’ has evolved from the world of psychology, where it originally applied to the psychology of perception. It has been appropriated by education and learning where it has been found to be ‘a valuable concept for describing educational interactions’ (Laurillard et al., 2000, p.3). Gibson, who first coined the noun, explains that an ‘affordance’ is what something ‘provides or furnishes... for good or ill’ (1986, p.127) and asserts that observers perceive the affordances of something – what it offers the observer - rather than its qualities. It describes something of the ‘interaction’ between the perceiver and what is perceived (Laurillard et al., 2000, p.3). Affordances exist whether or not they are recognised by an observer but ‘ambient light’, or the right conditions, is required to see the affordance (Gibson, 1986 p.140). Understanding the nature of the interaction between English teachers and IWBs can be supported by considering the affordances of IWBs for English teachers.

The second significant theory contributing to this study is Mayer’s cognitive theory of multimedia learning (CTML). Multimedia refers to presenting information in the form of words and pictures, and multimedia learning is when words and pictures are used to construct knowledge (Mayer, 2005). Mayer believes that ‘people learn more deeply from words and pictures than from words alone’ (2005, p.3), as learning in this way takes advantage of the way people’s minds learn. His theory maintains three assumptions: first, that information enters human minds via ‘dual channels’, one for verbal/auditory material and the other for visual/pictorial material (Mayer, 2005, p.34). The second assumption is that there must be active processing of the material, and the third is that the amount of information must be limited (ibid.). For Mayer, it is not the technology that is important but that teachers understand the significance of the three assumptions for effective learning.

The IWB with its facility for word, picture and sound would seem to be the perfect multimedia teaching tool. However, Mayer is cautious about the use of technology in learning, citing the failure of twentieth-century technologies to radically impact on education and asserting that even the computer has not seriously challenged
traditional instructor-led teaching. He ascribes the disappointing impact of technology on education to the failure of understanding the relationship between technology and education: ‘Instead of adapting technology to fit the needs of human learners, humans were forced to adapt to the demands of cutting-edge technologies’ (Mayer, 2005, p.9). Consequently, it is important for practitioners to gain a clear awareness and understanding of the place of the IWB in multimedia learning.

The learning and development of the case study teachers is also raised in this study, by means of considering their technological pedagogical content knowledge (TPACK) (Mishra and Koehler, 2006). Recognising the role of teachers as ‘curriculum designers’, Koehler and Mishra describe how teachers, who wish to successfully integrate technology into their teaching, must learn to handle the complex interactions between technology, content and pedagogy (2008, p.3). Teaching, as an ‘ill-structured’ domain, like biomedicine or writing, requires constant decision-making in a dynamic, shifting environment where the answers to problems do not have known correct solutions (ibid., p.4). The addition of new technology to this situation adds even greater complexity. The TPACK conceptual framework created by Mishra and Koehler (2006) addresses this complexity and provides a framework for considering the teacher knowledge required for integrating technology.

The TPACK framework recognises the importance of three key components of teacher understanding: content, pedagogy and technology. Crucially it also appreciates the importance of the interactions between these elements, as it is through understanding the complex connections and interplay between these elements that technology integration can be understood. This study uses TPACK to better understand the knowledge and learning of the case study teachers in using IWBs to teach English.

1.6 Research methodology

Once the research question has been established, ‘part of the methodology has been fixed’ (Andrews, 2003, p.82), as the question indicates the nature of the data required to answer the question, and suggests that particular methods may be required to
collect and collate that data. This is true of this study. The question indicates that the focus for the study is a small number of English teachers and this suggests that a case study approach may be warranted. Case studies aim to provide in-depth understanding of a particular case ‘in its natural setting, recognizing its complexity and its context’ (Punch, 2005, p. 144) and they are therefore associated with qualitative research designs. Other parts of the question, however, signal that quantifiable data is required. For example, ascertaining the user of the IWB and when IWBs are being used are both areas where ‘countable’ data will answer the question.

A mixed methods approach was chosen as the most appropriate way of organising the research as it allows both quantitative and qualitative methods to be used in conjunction. The researcher follows Bryman’s ‘technical version’ (2012, p.631) of quantitative and qualitative research, where methods from both approaches are ‘capable of being fused’ (ibid.) in a mixed methods approach. Unlike with the opposing ‘epistemological version’ (ibid.) where quantitative and qualitative research are viewed to hold ‘incompatible epistemological principles’ (ibid.), with the ‘technical version’ they are perceived as ‘autonomous’ (ibid.). Bryman suggests that either quantitative or qualitative methods can take priority (Bryman, 2012, p.632) but in this study, the methods are viewed as of equal weight and importance.

A case study approach provides an overall structure to the research, with seven teachers being the cases for detailed study. The limitations of a case study approach are recognised, in that the data and the resulting findings and discussion cannot be considered representative of all secondary school English practice. However, following Bassey’s view that ‘fuzzy generalization’ (1999, p.12) can arise from studies of individual cases, this present project raises significant ideas for consideration, which emerge from the cases studied.

Three main methods provide the data within each case:

1) systematic classroom observations of the case study teachers
2) content analysis of the IWB board content from each of the lessons observed
3) semi-structured interviews with the case study teachers.
The mixed methods approach has engendered both a comprehensive response to the research question as well as a well triangulated study, where opportunities to check, build on and corroborate data have been pursued.

1.7 The structure of thesis

This thesis presents the results of a study into IWB use within secondary English teaching. The next chapter will provide important contextual understanding by presenting a review of the literature relating to IWB use in schools. It provides a broad overview of the educational context for the rise of this technology, considering in particular the notion of transformation as it has been applied within this context. The review then focuses in on English and literacy teaching, to explore what other studies and commentators reveal about IWB use in this curriculum area. Next the affordances of IWBs for teaching and learning, as revealed by the literature, are examined. Particular attention is paid to the persons involved with the technology (the teachers and the learners) and to the processes that are involved (the teaching and the learning). Within these sections, important areas and concepts such as interactivity, control and whole-class teaching are considered. The final part of Chapter 2 reflects on the significance of the IWB as a multimedia resource.

Chapter 3 considers the methodological basis of the study. The case study approach is explained, and each of the data collection methods is described. Aspects of quality and ethics are discussed. Chapters 4, 5, and 6 deal in turn with each of the data collection methods, reviewing and exploring the data that emerges from each method. The Discussion Chapter follows, in which the findings from the different methods are jointly and critically considered. The final chapter draws together the main conclusions in the light of the main theories underpinning the study. Areas for further study are also identified.
2 LITERATURE REVIEW

2.1 Introduction

There is a growing body of critical study on IWB use within schools, including a number of illuminating literature reviews. Miller and Glover (2010), for example, consider that the literature relating to IWBs helps to provide understanding of interactive learning. Higgins, Beauchamp and Miller (2007) look in particular at the impact of IWB on learning and achievement, and Smith et al. (2005) consider classroom interactions, the perceptions of teachers and pupil attainment. A number of recurrent themes emerge from these reviews, such as motivation, interactivity and training. Such themes will also arise in this review because they are significant and on-going subjects for consideration. Where this review will differ most significantly from previous reviews is in its focus on IWB use in secondary English teaching. Specific consideration will be given to what can be gleaned from other studies on how IWBs support secondary English teaching.

In setting the foundations for this study, the review in this chapter will provide important contextual background, outlining the onset and establishment of IWBs, and summarising the nature and character of the IWB’s impact on education in general. It provides a broad perspective by describing the educational setting into which IWBs have emerged and, in particular, the association of IWBs with transforming the nature of learning. This review also provides detail on how IWBs are actually being utilised within the classroom, through considering their effect on teachers and teaching, and learners and learning. These aspects (the people and the processes engaged in educational activities) are considered separately so that the influence of IWB on all areas might be appreciated. Exploring the relationship between the different users (teacher and learners) and the technology is particularly important in understanding the pedagogical ways of using this technology. Pupil-led use, for example, might suggest a more collaborative or pupil-centred approach. Consideration is also given to the nature of the IWB as a piece of multimedia technology and an overview of the typical uses and functions of IWBs is provided. In summary, this chapter examines the available literature to explore the following areas:
• the context of the IWB in schools, and its transformational potential
• the IWB in English teaching
• the possible affordances of IWB for teachers and teaching, and for learners and learning
• how the IWB operates as a multimedia tool
• the uses and functions of an IWB.

2.2 Educational context: a transformative technology?

Within the UK, IWBs have been widely adopted by schools and are now established as a fundamental piece of classroom equipment in most schools (Messenger, 2013). Like PCs and laptops before them, IWBs have become part of the wider cultural shift to screen technologies. Kress’s seminal text, *Literacy in the New Media Age* (2003), first published at the same time as many schools were installing their first IWBs, focuses on the growing dominance of the screen over the book, and the image over the word. Interactive whiteboards reflect this cultural change. The facility for images, colour, sound, animation as well as words, make IWBs a technology type with a significant multimodal capacity. The large screen puts its main emphasis on visual modes in particular and, as Kress points out, the modes of word and image have different affordances: ‘The world told is a different world to the world shown’ (Kress, 2003, p.1).

The introduction and establishment of the IWB into the world of the classroom, therefore, indicates not only a shift in the style of teaching or delivery (reflecting the technological changes in the wider world) but may also alter the content and the messages given by teachers in the classroom. It is important, therefore, that practitioners recognise and understand the pedagogical implications of the rise of this technology.

Bolstered by government endorsement and funding (Condie and Munro, 2007), the UK saw a rapid expansion in the number of IWBs in classrooms from 2003 onwards with £50M being allocated for IWBs between 2003 and 2005 (Clarke, 2004). This government endorsement and investment has helped to place the UK as the world’s leading adopter of IWB technology (Lloyd, 2009). The technology itself continues to advance. Classroom presentational technology now includes the interactive flat panel...
(IFPD) which has the appearance of a large, flat touchscreen computer and the interactive projector (IP) which combines projector and camera technology to produce an interactive effect on a non-interactive surface such as a traditional whiteboard.

Whilst IFPDs and IPs are expected to have an increased presence, IWBs continue to dominate the education market in the UK where 85% of UK classrooms had interactive display technology in 2012 (Figure 2.1), a figure projected to rise to 97% by 2017 (Messenger, 2013). The next highest penetrations of IWBs in 2012 can be found in Denmark (62%), the Netherlands (58%), Australia (53%) and the United States (47%) (ibid.).

**Classroom Interactive Display Penetration**

![Figure 2.1: Penetration of IWBs for 2012 and predicted for 2017 (Messenger, 2013)](image)

However, in the first half of 2013, it is Asia that is responsible for over half of the world’s sales of IWBs and IFPDs, with China the biggest single country market, accounting for 40% of global sales (Milligan, 2013). Despite the economic downturn, other countries are following the lead of the UK (Lloyd, 2009) where integration of the technology is most established (Hennessy and London, 2013).

One reason for such high levels of adoption in the UK can be found in developments occurring at the same time as the rise of the IWB. The National Literacy Strategy...
(NLS), launched in the late 1990s, was a key part of the government’s thrust to transform teaching and learning. It obliged primary school teachers to look beyond curriculum content and to examine and modify how literacy was being taught. The NLS moved beyond the NC’s broad outline of curriculum content, by providing a series of teaching objectives and teaching strategies, including the introduction of the ‘literacy hour’: a template for the timing and class management of literacy teaching. This template indicated that whole-class work, including shared work and focused word level work, was to account for two-thirds of each lesson (DfEE, 1998). The NLS was having a direct impact on the pedagogy of the primary literacy classroom, prescribing the structure of the teaching sequence. This approach was repeated with secondary teachers in the form of the Key Stage 3 Strategy (DfEE, 2001). Similar teaching strategies were encouraged within the secondary English classroom, approaches that promoted shared (whole-class) reading and writing, as well as greater whole-class interaction. Within this period of widespread change and modification to traditional approaches to teaching, IWBs - with their large screens providing displays that were accessible to everyone in a classroom - found a seemingly natural niche in supporting whole-class study. Their adoption became part of the government’s drive to improve standards.

Heavy investment was accompanied by great expectations. The government’s strategy document made its ambition clear within the title: Harnessing Technology: Transforming Learning and Children’s Services (DfES, 2005). The then Education Secretary of State for Education, Ruth Kelly, stated that ‘Our plans for boosting performance and standards across education are far reaching and radical’ (DfES, 2005, p2). IWBs had particular pertinence in meeting two of the four strategic key objectives for developing the use of technology: transforming teaching and learning, and engaging hard to reach learners (DfES, 2005).

The association of IWBs with transformational teaching and learning is a theme that emerges within the body of literature on IWBs (for example, Burden, 2002; Kennewell, 2006; Schmid, 2006; Rudd, 2007). The notion of transformation appears to indicate various features, for researchers and commentators, including ‘communal
learning’ (Kennewell, 2006, p.7); using IWBs for ‘knowledge construction for pupils not knowledge accumulation’ (Burden, 2002, p.9); using ‘a richer diversity of genuine multimedia resources’ (ibid.) and learners using the IWB ‘for self-expression’ and to ‘share their knowledge with the whole group’ (Schmid, 2006, p.56). Transformation, in regard to IWB use, is a concept that varies between researchers but generally appears to build on a socio-constructivist approach to learning (Pritchard and Woollard, 2010), where learners collaborate in building and sharing knowledge through the utilisation of the multimedia capabilities of the IWB. This is certainly a welcome ambition, but the notion of transformation itself may raise obstacles to change.

As a term, transformation carries connotations of ‘marked change’ or ‘sudden dramatic change’ (Oxford Dictionary of English, 2010, p. 1888), and observers looking for evidence of a rapid or remarkable change in practice may be disappointed. Changes in school-based practice, which involve changes in the theoretical aspects of learning indicated above, are unlikely to be sudden. Rather they are likely to be the result of a process of ‘deliberative learning’ (Wilson, 2013, p.4) where teachers consciously manage thought and activity ‘to learn about and engage in activities which are directed towards a clear workplace goal’ (ibid.). Change within classroom practice therefore requires time for reflections, managed actions and clear goals. The introduction of technology in itself is not sufficient to bring about change with most practitioners. There is no ‘agency’ within the technology itself that might bring about such a change. Change is within the hands of the teacher, although the IWB might be considered a catalyst for change (Cogill, 2010).

It is perhaps not surprising, therefore, that the anticipated transformation in learning has proved to be elusive. Reporting on the progress of the government’s strategy, Becta (the government agency supporting the use of technology in schools) noted the rising availability of IWBs, as well as the positivity and increased motivation of the learner, but acknowledged that whilst there were ‘indications... of positive impact on learning’, these were limited (Becta, 2006, p.12). Research studies looked for transformation but could not find clear evidence. For example, one study looking at
the use of IWBs in four urban primary schools, accepted that IWBs enabled ‘a very lively, varied, quite complex and interactive lesson’ but they found that lessons remained conventional in terms of the pupil-teacher dialogue patterns and concluded that ‘the use of the IWB cannot be claimed to ‘transform teaching’ in terms of classroom dialogue and underlying pedagogy’ (Gillen, Staarman, Littleton, Mercer and Twiner, 2007, p.254). In another study, examining IWB use in 184 primary school lessons, over a two-year period, Smith, Hardman and Higgins claim that many commentators have been ‘seduced by the technology’ into assuming changes in classroom interactions but their findings show that ‘traditional patterns of whole class interaction persist’ (2006, p. 455). At secondary level, the Evaluation of the Schools Whiteboard Expansion (SWE) Project: London Challenge did not find evidence of impact on pupil performance, within the first year of IWBs being installed, although they point out that ‘transformation of secondary school pedagogy is a long term project’ and that the findings were in line with what the researchers would expect (Moss et al., 2007, p.4). This conclusion from Moss et al. above is a helpful reminder that any changes in practice can be gradual or more subtle than anticipated.

Haldane (2007) sees subtle but significant changes in practice in her study of IWB in four primary schools. She views the IWB as a ‘stable medium’ (Haldane, 2007, p.259) where the content is fixed and not short-lived. Unlike ‘transient media, such as television’ (ibid.), IWBs allow content to be navigated at a suitable pace. Through a process of ‘micro-analysis’ (Haldane, 2007, p.262) of short interactions between teacher and pupils, Haldane demonstrates how the stability of the IWB helps to overcome the transiency of the spoken word by allowing the teacher to use the IWB to explore key ideas and terms through fluent navigation and highlighting, thereby supporting an effective learning discourse. This practice enables the creation of a social dialogic space between teacher and learner (Vygotsky, 1978).

A study of the use of IWBs to support dialogic pedagogy has also been conducted by Warwick, Hennessy and Mercer (2011). The teachers within their study, who worked as co-enquirers with the researchers, had been noted to already have ‘an observably dialogic pedagogical approach... and of using the IWB confidently’ (Warwick, Hennessy and Mercer, 2011, p.305). These teachers were challenged to use IWBs to develop an
effective dialogic pedagogy; transformation of their teaching was neither required nor necessary. The researchers found that with the right conditions, the IWB can help ‘create a genuine dialogic space for interaction between children and ideas’ (Warwick, Hennessy and Mercer, 2011, p.312). They note that teachers who show a good understanding of how children learn ‘will gradually and iteratively integrate the use of a new technology to serve their well-founded pedagogical intentions’ (Warwick, Hennessy and Mercer, 2011, p.315). This study encompasses four elements of importance for successful IWB use:

- a clear pedagogical aim
- teachers working as co-enquirers
- the notion of transformation is ignored
- there is acceptance that change may be gradual

The latter two in this list have particular significance to this study. The notion of transformation is acknowledged but is not considered of import. Indeed the search for transformation could be considered a distraction from the real focus of the study which is to provide an informative and enlightening picture of how IWBs are being used in English teaching. Detecting details that indicate gradual or slight changes in typical practice may provide helpful indications of how this technology can best support English teaching in future.

The development of IWB use has now shifted to schools. The period of government interest in promoting IWBs in schools drew to a close at the end of the ‘noughties’. The coalition government, formed in 2010, signalled a reduced role in ICT in schools by closing Becta as part of cost-cutting measures (Becta 2011) and announcing ‘our judgement is that schools are now in a position to manage much of this themselves’ (DfE, 2011).

Despite the government’s seeming withdrawal of interest in schools technology, investment by schools in IWBs has continued. Whilst the penetration of IWBs in the UK has continued to rise, the overall sales have slowed as the market approaches
saturation point. However, schools are now beginning to replace boards and to opt for larger and more expensive options (Messenger, 2013). Alternative display options such as using tablets and IPs are being adopted by some, but 5% of all sales in 2012 were replacement boards, a figure which is set to increase (ibid.). The continuing investment by schools in IWBs, and in particular the occurrence of replacement sales, would appear to indicate that IWBs are now accepted as a standard piece of technology in most schools. In short, the second decade of the twenty-first century has seen the IWB attaining a state of ‘normalisation’ (Bax, 2006, p.7) in UK classrooms. Considering what this normalisation looks like for English teachers, is a major thrust of this study.

2.3 IWBs in English teaching

A striking finding of this review is that the body of literature related to IWBs in secondary English teaching is very limited. There is a small number of texts that provide guidance on how to use IWBs in the English classroom (for example, Millum and Warren, 2008; Burnett, Merchant and Myers, 2005) which fit within a wider body of texts giving generic advice on using IWBs (for example, Sharma, Barrett and Jones, 2011; Barber, Cooper and Meeson, 2007; Braham, 2006; ). There are very few critical studies which focus solely on the use of IWBs in secondary English teaching. One example is a study by the National Association for the Teaching of English (NATE) reviewing the impact of a training initiative on IWBs (Smith, 2008). Studies of IWB use in an English-teaching context, tend to be part of studies focusing on a number of school subjects (for example, Moss et al., 2007; Armstrong et al., 2005;) or they occur within a different phase of teaching, usually primary school practice (for example, Wood and Ashfield, 2008; Gillen et al., 2007; Somekh et al., 2007; Cogill, 2002). The completion of a number of studies, which might be termed a body of study, has arisen around the use of IWBs in other secondary school subjects, notably the core subjects of mathematics (for example, Miller and Glover, 2007; Miller and Glover, 2006; Davison and Pratt, 2003) and science (for example, Hennessy, Deaney and Tooley, 2010; Hennessy, Deaney, Ruthven and Winterbottom, 2007; Beauchamp and
Parkinson, 2005). However, the same is not true for the remaining core subject of English.

The paucity of study into IWB use in secondary English indicates differences between the core subjects and raises the question of why this lack of study into English use of IWBs exists. English appears to be being perceived differently in relation to IWB use. This difference is highlighted by Moss et al. (2007) within their substantial report evaluating the London Challenge element of the Schools Whiteboard Expansion Project. The study examines the introduction of IWBs into nine core subject departments in London schools and it notes that the uptake of IWBs in English was slower than in mathematics and science. This pattern is reiterated in their records of use, which show mathematics and science departments to be greater users of the technology than English departments. Moss et al. (2007) observe that IWB use does vary between subject areas, and they highlight some differences in patterns of use. For example, they note that the use of the technology to support the visualisation of abstract concepts might be more appropriate to mathematics and science than to English. They note that the use of IWBs to inject pace to the learning might be more suited to a mathematics lesson than an English lesson.

Underpinning these observations appears to be ‘an assumption that IWB technologies offer most benefit to Maths and Science rather than English’ (Moss et al., 2007, p.47). The report does not specify who is making the decisions on IWB deployment within the schools nor their rationale. It may be that the pattern established – of mathematics and science having first access the IWBs – perpetuates the situation. Access to the technology is a necessary factor ‘in developing confidence and expertise in using the IWBs’ full range of potentials’ (Armstrong et al., 2005, p.466). Where access and resources do not exist, practice cannot establish itself and develop, and it is possible that schools and teachers fail to see potential uses.

The benefits of access and familiarity with IWB use are confirmed by Somekh et al. (2007) who evaluated the Primary Schools Whiteboards Expansion Project. Their evaluation looked at data from schools in twenty-one local authorities and examined
the effects of IWB use on core subjects. Unlike the disparity of access by the core
subjects noted at secondary level by Moss et al. (2007), the acquisition of an IWB in a
primary classroom allows for parity of access for literacy when compared with
numeracy lessons. Looking at attainment data, Somekh et al. found positive trends for
using IWBs with most groups of pupils in KS1 and KS2, although acknowledged that as
‘measures of attainment in English are less stable than in maths and science’ the
results were less conclusive and require further investigation (2007, p.5). The report
asserts that positive attainment gains are associated with the greater the length of
time that teachers (and therefore pupils) work with IWBs. Sustained experience with
an IWB of around two years enables teachers ‘to change their teaching practices to
make best use of its facilities’ (Somekh et al., 2007, p.4). The conclusions from these
two significant reports (Moss et al., 2007 and Somekh et al., 2007) indicate differing
practices in IWB access for English at secondary level and literacy at primary level.
There certainly appears to be a greater literature base on IWB use for English/literacy
at primary level than there is at for secondary English teaching (for example, Betteney,
2009; Wood and Ashfield, 2008; Becta, 2006b; Smith, Hardman and Higgins, 2006;
Cogill 2002).

It is difficult to gain any comprehensive picture from available literature of which
aspects of English and literary teaching and learning are being addressed by using an
IWB. There is some consensus in the view that the IWB is an appropriate tool for
supporting whole-class teaching (Moss et al., 2007; Somekh et al., 2007). However,
the examples of English and literacy work undertaken often relate to experience or
comments of only one teacher. For example, individual teachers at primary level have
described using the IWB to support reading with the whole class, and exploring the
use of paragraphs through manipulating chunks of text (Somekh et al., 2007).
Similarly, a teacher of Year 8 English students, used the IWB to introduce text types,
and to manipulate and editing text as part of the writing process (Armstrong et al.,
2005). Sometimes, the experiences described show contrasting experiences. For
example, resources were considered easily available at primary level where a ‘large
number of resources are available and easy to find’ (Somekh et al., 2007, p.64) but at
secondary level, English teachers ‘were most likely [of the core subjects] to find it
difficult to access IWB resources’ (Moss et al., 2007, p.24). The perceptions of
teachers and pupils are also seen to differ. In a small-scale study of IWBs being used
for primary literacy lessons, Shenton and Pagett (2007) note that teachers’
perceptions are of the IWB being used to support the teaching of both writing
(modifying, saving and revisiting texts) and reading (securing access to a wide range of
texts). They note the pupils tend to associate IWB use with subjects other than
literacy, and any literacy-focused activities they recall are text-based activities ‘such as
work with a poem or a set of instructions’ (Shenton and Pagett, 2007, p. 133).
Generally, whilst individual responses from teachers might be offered as being
representative of other experiences and views, it is not possible yet to build a picture
of typical uses and experiences with the subject of English. The next section of this
chapter looks beyond English as a subject, and explores the broader picture of how
IWBs are being used in the classroom.

2.4 The affordances of IWBs for teaching and learning
There is a growing body of research, information and comment on the impact of IWBs
in the classroom including a number of substantial evaluative school studies (for
example, Somekh et al., 2007; Moss et al., 2007). This section will attempt to give an
overview of the changes IWBs are perceived to have brought to classrooms, drawing
out the main threads of interest, debate and concern that have arisen. It will focus on
four main areas:
  • the effect on the teacher
  • the effect on teaching
  • the effect on the learner
  • the effect on learning.
There is, of course, ‘an essential dialogue between teaching and learning’ (Beetham
and Sharpe, 2013, p.2) but here there is a recognition of the differences, sometimes
subtle and sometimes blurred and overlapping, between the two. Furthermore, this
section attempts to draw out the different effects on the two agents in the ‘dialogue’,
i.e. the teacher and the learner, as any helpful analysis needs to appreciate the effect
of the technology on the persons, not just the processes involved in teaching and learning.

2.4.1 The effect on the teacher

As of 2012, 85% of UK classrooms have been equipped with some kind of IWB technology (Messenger 2013) and with numbers predicted to rise to 97% in 2017 (ibid.), this is a piece of technology that will be encountered by most teachers. Such widespread installation of the technology has implications for teachers’ engagement with IWBs. This section will explore the relationship between the IWB and the teacher, considering familiarisation, training and control.

Familiarisation and proficiency
Hooper and Rieber (1995) have provided a helpful model for understanding technology adoption. They propose that teachers adopting new technologies follow these stages of implementation:

- ‘familiarisation’ – the initial introduction
- ‘utilisation’ – trying out the technology in a limited way
- ‘integration’ – it becomes a planned and necessary part of teaching
- ‘reorientation’ – using the technology to consciously promote learning
- ‘evolution’ – evolution and adaptation of the learning environment

(Hooper and Rieber, 1995, pp. 3-4).

A teacher’s requirements for training are dependent on their stage of development in using a particular technology. Those focused on the ‘nuts and bolts’ of implementation of IWBs in the classroom are at the utilisation stage of Hooper and Rieber’s model. The utilisation phase indicates the stage where teachers are trying out a piece of technology. The use of the technology is limited and there is a danger that they fail to realise the further potential of the technology or even abandon it altogether. It is once they arrive at the integration stage, that teachers gain the ‘whiteboard dependence’ noted by Hennessy et al. (2007, p.286), which is where IWB use becomes an indispensable element of their teaching. However, it is important that practitioners
continue to progress through the stages as ‘The full potential of any educational technology can only be realized when educators progress through all five phases’ (Hooper and Rieber, 1995, p. 2).

Glover and Miller have noted varying attitudes to the emergence of IWBs, characterising the different teacher-types as ‘Missioners’, ‘Tentatives’ and ‘Luddites’ (2001a, pp. 2-3): ‘Missioners’ have a keen and passionate interest in the technology, with a desire to ‘evangelise’; ‘Tentatives’ see the potential but need to overcome obstacles; ‘Luddites’ are opposed to adopting the technology. Similar categories of teacher attitudes towards ICT include: ‘enthusiasts’ who are captured by the potential; ‘pragmatists’ for whom potential outweighs possible objections; ‘traditionalists’ who set aside ICT in favour of human interaction and ‘New Luddites’ who actively undermine ICT (John and Wheeler, 2008, p. 2). Whilst such characterisations may provide helpful indicators of attitudes, they also belie a more nuanced or complex set of attitudes towards IWBs. For example, some practitioners express fear or ‘unease’ (Warwick, Hennessy and Mercer, 2011, p.315) with the IWB or they may feel that their use is inadequate or ‘ineffective’ (ibid.). Such attitudes may arise from reports and studies which question how teachers use the technology. One teaching magazine article, questioning how IWBs are used in classrooms, issued a number of searching questions as subheadings, including: ‘Does the IWB restrict pedagogy?’ , ‘Does the IWB distort modelling?’ , ‘Does the IWB stifle creative thought?’ (Betteney, 2009, p.4). Such questions may emphasise a sense of unease in this technology by suggesting there is a correct way to use IWB technology. This study refutes the idea of correctness with regard to IWB use. Rather it is concerned with determining and understanding IWB use within English teaching, with a view to helping teachers make informed choices in how they use IWBs.

Despite some evidence of unease amongst teachers, many of the studies on IWB use reveal a largely positive reaction by teachers to the technology (for example, Jewitt, Moss and Cardini, 2007; Kennewell and Higgins, 2007; Moss et al., 2007; Somekh et al., 2007; Gray, Hagger-Vaughan, Pilkington and Tomkins, 2005). In their small-scale qualitative study of IWB by modern foreign languages (MFL) teachers in a language
college, Gray et al. (2005) used observations, interviews, teaching logs and focus meetings to gather data on how MFL teachers reacted to the introduction of IWBs. Their study was initiated by the teachers, who consequently dictated the pace of the research and their voice remains strong in the study’s conclusions. Notwithstanding some reservations ‘Participants unanimously felt that the use of the IWB has positive effect on their teaching’ (Gray et al., 2005, p. 43). Larger studies, using mixed methods, have observed the same reaction. Interviews and survey responses from nine core-subject departments in London secondary schools, gleaned by Moss et al. revealed that teachers were generally ‘very positive about the technology’ (2007, p.8). Somekh et al. also studied case study schools, in seventeen primary schools, using methods which included questionnaires, observations, teacher logs and interview, and observed that the IWB was ‘welcomed enthusiastically’ by large numbers of teachers (2007, p.4).

Successful adoption of this technology takes time. Haldane provides a reminder of the complexity of the technology which allows the teacher to write on the board, as with non-interactive boards, but which integrates this with the multimedia capabilities of a computer screen:

> Software can be controlled directly from the board, by means of either a finger or a peripheral device...and existing computer software can be integrated with that designed specifically to take advantage of the affordances of this new medium.

(Haldane, 2010, p.182)

In a model consistent with Hooper and Reiber (1995), Haldane maps out the development of IWB skills through creating a typology of IWB proficiency development (Figure 2.2).
At *foundation* level, teachers use the board for presenting information, and primarily use the mouse and keyboard rather than the IWB itself. At *formative* level, teachers mostly work at the board and use a growing range of tools. *Facility* level describes teachers who have control of the main functions of the board and who are using special features of the board. They are creating their own resources. *Fluency* indicates a user who uses functions such as hyperlinks, who experiments and who gathers new ideas and content. The top category, *flying*, is the level for ‘virtuoso performers’ (Haldane 2010, p.187) who use variety, improvisation and a high level of interactivity with pupils. This typology provides a sense of a developing engagement between teacher and the technology. A lack of development will therefore occur if a teacher stalls, for example at the level of *facility*, and stays at that level. Progression depends on teachers understanding what skills need to be mastered when using IWBs.

Proficiency with using IWBs takes time to achieve. Somekh *et al.* (2007) estimate it takes two years of daily IWB use for teachers to become competent and confident users, and for the IWB to impact on their practice. Time and practice are important but so, it seems, is training. Somekh *et al.* (2007) observe that it is only those teachers who receive ongoing training, sometimes via manufacturers’ accreditation courses, who develop high level skills. They also note that within their study ‘the pool of expertise in
interactive whiteboard use resided in the schools where teachers had been using them on a daily basis for more than two years’ and consequently teachers in these schools were being sought by local authorities to provide training for their peers (Somekh et al., 2007, p.9).

**Training**

Overall, training does not appear to be a strong area of IWB implementation. Initial training often focuses on the operation of the board itself, and gives little subject input. Moss et al. note a ‘poor take-up in formal training’ (2007, p.59) together with a preference for teachers to seek training as and when they need to know in their own classroom setting. Such ad hoc needs may be facilitated by a ‘Missioner’ member of staff (Miller and Glover, 2007, p.322). Lead teachers, mentors, ‘Missioners’ or a core team of experienced practitioners have been noted as being inspirational and supporting good practice (Egerton, Cook and Stambolis, 2009; Miller and Glover, 2007; Moss et al., 2007) but they are rarely given time or support for this important role (Miller and Glover, 2007). This latter study by Miller and Glover (2007) explores the induction experience of mathematics teachers in seven secondary schools. They note that there is comparatively little IWB training focused on the subject-focused software, and ‘very little thought given to the need to consider pedagogic training’ (Miller and Glover, 2007, p.328). This is echoed by a study of training for all three core subjects which notes that very little of the formal IWB training appeared to provide ‘a forum for teachers to think about how the use of the IWB could potentially alter their pedagogical teaching style’ (Moss et al., 2007, p.59). There is a clear and well-understood distinction to be made, therefore, between ‘technical and pedagogical training’ (Moss et al., 2007, p.56), and there is also a growing body of IWB-experienced practitioners and ‘sufficiently expert users’ (ibid.). Users of IWBs need to master the physical and technological operation of an IWB, as well as understanding the pedagogical demands of using an IWB to support teaching and learning. What concerns Moss et al., however, is ‘the lack of certainty about the best application of the technology to enhance pupil learning in specific subject areas’ (2007, p.57). By providing further information and clarity on the use of IWBs in
selected secondary English teaching, this study seeks to contribute to knowledge in this area. It is only by recognising and understanding types of use within English teaching, that training needs for effective practice can be identified and established.

Moss *et al.* (2007) draw attention to the different experiences of primary and secondary practitioners, suggesting that consideration of similarities and differences might usefully feed into training for both phases. There may be significant differences in the training patterns. When considering ICT training in general, *The Harnessing Technology Schools Survey* observed that nearly almost all primary teachers gain ICT training as opposed to 55% of secondary colleagues, and that primary teachers are more likely to be positive about ICT training (Kitchen, Finch and Sinclair, 2007). Condie and Munro (2007) observe that whole school technology initiatives tend to be more successful in primary schools than secondary schools. So it is perhaps not a surprise to sense this same trend in the literature regarding IWB training. It may also be related to the nature of the teachers’ training needs and to the environment both sets of teachers work within. Primary practitioners, who teach a wide range of subjects, may find it easier to apply technological and pedagogical practice across subjects. Their need for subject specialisation may also be less marked. Secondary colleagues, on the other hand, need to focus on subject-related practice very quickly, and the evidence shows this to be less readily available. Consequently, an important area of focus for this study is ascertaining the training experience of the teachers involved.

**Teacher control**

Notions of transformative learning, as noted in Chapter 2.2 above, convey a sense of students constructing their learning with growing independence. An implication of this is that the learner is actively engaged in learning, and is not a passive partner in the learning relationship between teacher and learner (Pritchard and Woollard, 2010). In such a model, the learner needs to have more control over learning (*ibid.*). In a study assessing how teachers use IWBs in the modern foreign languages classroom, Gray (2010) examines whether teachers use IWBs to help them cede more control to the
learners. Her findings suggest that the teachers studied actually use IWBs to secure an even greater element of teacher control over the learning. She notes that within her small-scale study, despite the fact that many of the participants saw themselves as ‘facilitators’, the evidence showed that ‘the practice of the majority did not demonstrate the facilitation of autonomous learning in its traditional interpretation, rather its opposite: increased control over lesson content, pupil activity, pupil behaviour and learning and performance outcomes’ (Gray, 2010, p.81). Lessons which are planned in detail through PowerPoint presentations reveal control that is ‘far stronger than in lessons using paper resources, though carefully disguised’ (Gray, 2010, p.78). Gray sees that whereas other technological developments have given greater independence on the part of the learner, an IWB increases teacher control of both content and behaviour.

The question of power and control is also addressed by Schmid (2008). Within her own teaching as a teacher of adult English language learners, she observes that within a study where she was both teacher and researcher, she sometimes had difficulty in managing the IWBs capacity for linking numerous resources together with an approach that encouraged learner involvement: ‘By analysing the video recordings of the lessons, I could observe that on several occasions I tended to use hyperlinks more as an instrument of power than as a way of encouraging learners’ active participation’ (Schmid, 2008, p.1564). Schmid sees the tendency for power to be anchored with the teacher rather than the learner.

At primary level use, Somekh et al. (2007) note the tendency for overt teacher control might not be so strong in some cases. Whilst teachers tend to control its use, rather than asking students to use the IWB, the study saw many classrooms where ‘the ambiance was of teacher and pupils ‘working together’. The most successful are often those who use it as an opportunity to model the role of co-learner with the pupils’ (Somekh et al., 2007, p.7). So the model may be one of the teacher operating the board, but doing so in a way that the teacher and pupils work together on the content.
Studies, such as those cited above, reflect a developing picture with regard to pedagogy and teacher control. Rudd (2007) comments on this changing situation. He recognises both the huge pedagogic and commercial implications of any change in traditional pedagogy:

_The notion of an approximate 1:30 classroom with the teacher at front ‘controlling’ the lesson through a process of ‘knowledge transfer’ was clearly (and many argue still is) a ‘given’, determined by historical and political guidelines, requirements and foci._ (Rudd, 2007, p.9)

This situation, he maintains, is so clearly the norm that it would be ‘challenging’ and even ‘reckless from a business perspective’ to design a tool that deviated from this model (ibid.). However, he does note the emergence of software and approaches that encourage more dynamic and collaborative practices ‘and there is much evidence to suggest this is happening in more classrooms, at least at certain times and for particular purposes’ (ibid.).

The widespread adoption of IWBs into classrooms should ideally provide teachers with sufficient opportunity for familiarisation, development of proficiency and gaining an understanding of the pedagogical opportunities presented by IWBs. Teachers require not only the ‘technical skills required for mastery of the IWB’s functionality’ but also ‘the development of pedagogy so that the full potential of the IWB’s functionality for enhancing teaching and learning is realised’ (Haldane, 2010, p.182). The skills, knowledge and understanding for using IWBs effectively must be underpinned by training. There is a particular need for training to address the development of IWB pedagogy. At the moment, the lack of a strong training base, particularly one that addresses pedagogy within subject areas, hinders teachers’ development in the use of this technology.
2.4.2 The effect on teaching

This section will examine what research in this area reveals about the possible and perceived effects of the IWB on aspects of teaching. In particular, it will consider the following features:

- lesson planning and preparedness
- lesson content
- aspects of lesson pedagogy, including:
  - whole-class teaching
  - interactivity
  - pace

**Lesson planning**

A noticeable consequence of IWB use is the increased conspicuousness of the teacher’s preparedness. The presence of an IWB encourages practitioners to plan the use of the board - and consequently the lesson – and prepare the resources in a more manifest manner (Cogill, 2010). This planning involves elements which are different from a non-IWB lesson. Haldane (2007) draws on her experiences as part of the *Primary Schools Whiteboard Expansion Evaluation Project (SWEEP)* to examine the role of interactivity in lessons with IWBs and observes that teachers plan differently for lessons involving IWBs. It enables a more rehearsed consideration of lesson content (than a traditional whiteboard), allowing teachers to ‘perform dry-runs’ before going ‘live’ in the classroom’ (Haldane, 2007, p.266). The IWB allows teachers to preview sequences of resources in a way not easily replicated by traditional boards:

*This process is inherently more thorough than the best lesson planning possible with static boards where teachers are, in essence, working out how best to download their own tacit knowledge live and make it explicit via speech and writing/drawing on the board.* (ibid.)
Teachers need to make decisions about not only the content but also how to make the best use of the IWB’s capabilities in the presentation of that content. They must evaluate electronic resources and weigh them up against traditional methods. Decisions must be taken on which IWB functions to use, and whether to have ‘virtual’ or ‘touchable’ resources (Haldane, 2007, p. 266).

Whilst the picture of planning presented so far indicates a prepared and rehearsed use of the IWB, elsewhere there are signs of unplanned and spontaneous use. Somekh et al. (2007) note that IWBs in primary classrooms tend to be left on for the whole day, allowing for instant and spontaneous access to the Internet and other digital resources. The increased flexibility with planning may perhaps come at a price for the teachers concerned: ‘The traditional paper-based lesson plan is no longer capable of giving a full picture of the preparations that conscientious teachers undertake for interactive whiteboard lessons’ (Somekh et al., 2007, p.50). The implication is that more time is spent on planning although this lessens with time, as teachers begin to benefit from being able to reuse resources created previously (ibid.). Teachers can also benefit from shared planning by swapping resources with colleagues. As well as being efficient, this has the added benefit of teachers sharing pedagogical approaches (Cogill, 2010).

What seems clear is that lesson planning has changed for teachers using IWBs. They have different considerations to make and the process itself has become a more prominent, and often more visible, aspect of their practice. Gaining insight into the practice of planning for IWB use is a focus for this study, with a view to developing a heightened awareness of this area.

**Types of content**

Software, in particular PowerPoint and IWB-specific software, has supported the preparedness of teaching and influenced its content. There are different software packages associated with the different makes of IWB. The two main makes present their software as electronic notebooks (Smartboard) or flipcharts (Promethean) and, in
this study, this type of software is referred to as electronic notebooks/flipcharts (ENF). Perhaps the single program most associated with the IWB is PowerPoint. This program allows the user to create screens or ‘slides’ of content (often written text) and then facilitates the progression of the slides. Jewitt, Moss and Cardini, in an article focusing on the design of IWB texts, cite an example of a mathematics lesson in which the linear structure of PowerPoint slides ‘had the effect of strongly framing the content, structure and pace of the lesson’ (2007, p.311). The use of such programs on the IWB, therefore, has a potentially powerful effect on the lesson. PowerPoint and ENF enable teachers to produce sequences of key information, such as lesson objectives and instructions, and collate resources in a convenient and accessible package. Both are presentational and organisational aids, but as Barber, Cooper and Meeson (2007) point out, the ENF software has the added advantage of being more suited to being worked on and adjusted during teaching, and this facilitates the saving and capture of the teaching and learning. ENF supports both the presentation of content and also the manipulation of that content, whereas a PowerPoint presentation is usually prepared in advance and viewed, but not changed, during the lesson. Considering the use and the affordances of these key programmes is an important element of this study, which discusses the implications of the programmes for teaching English.

The writing and preparation of texts for use on an IWB has become a key part of teaching with an IWB. In their study of core secondary subjects, Moss et al. (2007) found that the bulk of IWB texts are teacher-prepared and that 78% of teachers created their own texts for IWB use, making text design an integral part of the process of IWB use in lessons (Jewitt, Moss and Cardini, 2007). However the researchers also noted that ‘many teachers struggle to incorporate principles of design which can establish clear reading paths for pupils’ (Moss et al., 2007, p.27). Learners need to be able to access and understand the content of IWBs, so that they can identify key instructions, for example. Teachers may be engaged in creating the content for IWBs, but it seems that they are not always presenting texts in an accessible form for their students. The design of IWB resources has emerged as an important continuing professional development (CPD) requirement for practitioners.
Moss et al. also provide a helpful summary of the types of texts in use on IWBs, drawing a distinction between ‘real-time’ texts (2007, p. 25) - for example, texts created or annotated by teacher and pupils during the lesson - and prepared texts. The IWB is a flexible format, whereby the teacher can switch uses from traditional whiteboard, to television/film screen to computer screen. It has both the capacity to be ‘absorbed’ into existing classroom practice and to ‘mimic’ other technologies, meaning that teachers can use it in traditional ways as well as an innovative technology (Moss et al., 2007, pp. 39-40). The facility to switch between modes is a key factor in its effectiveness and Somekh et al. perceive the IWB as a ‘multi-modal portal’ for teachers (2007, p. 5). It is this dynamic aspect of the IWB that make Jewitt, Moss and Cardini (2007) feel that it has the potential transform pedagogy. However, they assert it will not happen automatically; teachers will need support and training to bring this about.

When a classroom moves from traditional whiteboard use to IWB use, it is echoing the trend in wider society, noted by Kress (2003), whereby writing and books are losing dominance to image and screen. Haldane notes that ‘The high production values of IWB content... compare well with those of other media with which pupils engage in their leisure time’ (2007, p. 261). So the IWB is a medium with the potential to exact significant levels of engagement. Although the content of IWBs has been dominated by text (Moss et al., 2007), this balance may shift, so that multimodal content will become the principal content of IWBs. That is not to imply the change in content will improve the teaching and learning – ‘dynamic visuals’ do not necessarily produce learning (Smith et al., 2005, p.97) – but it is a reflection of the shift in media in society in general. Barber, Cooper and Meeson suggest that texts produced in a variety of modes ‘reinforce learning to minds that respond best to different stimuli’ (2007, p.35), and this may well be conducive to learning. However, there is also a helpful word of caution from Schmid that ‘multiple representations of information do not always help learning’ (2008, p.1554) and that a better understanding of how people react to multimedia is required. Considering cognitive load theory, Schmid conjectures whether too much visual and audio stimulus may lead to ‘cognitive overload’ (2008,
p.1556). Clearly further research is required on the considerations of the design of multimedia content in lessons.

**Aspects of pedagogy**

a) **Whole-class teaching**

In terms of pedagogy, the IWB is perceived as being particularly suited to whole-class teaching (e.g. Moss et al., 2007; Somekh et al., 2007). Gillen et al. (2007, p. 244) note that the IWB ‘is the only educational ICT tool expressly designed for whole-class interaction’. Somekh et al. point out that the IWB is ideal for supporting whole-class teaching, and that the teacher can model processes and in some schools, teacher and students work together on the board, so that the teacher takes on the role of ‘co-learner’ (2007, p. 6-7). They see the IWB as a mediation device for interactions with pupils. The IWB facilitates the joint consideration and examination of texts. Haldane discusses the importance of dialogic interaction and how IWBs can support the ‘dialogic space’ (2007, p. 259) for learning in lessons, for example by capturing comment and dialogue through annotation or by referring back to previous screen. Whilst such tasks as annotation may be completed through traditional whiteboards or flipcharts, the IWB makes the process less time-consuming and clumsy.

In a small-scale study of IWB use in secondary science, focusing on lesson observations and interviews with three teachers from separate schools, Hennessy et al. (2007) noted that interactive whole-class teaching was the predominant type of IWB use, accounting for 72% of lesson time. The researchers concluded that effective learning took place and learners were cognitively engaged but they were concerned that more pupil engagement with the IWB and learning was being stifled by the demands of pace and a content-laden curriculum. The potential problems of using a dominantly whole-class focused pedagogy is highlighted in a much larger study by Smith, Hardman and Higgins (2006). Their research, which included the observation of 184 lessons (over two years) looking specifically at teacher-pupil interaction in KS2 literacy and numeracy lessons, used a computerised logging system to record the types and the timing of discourse moves, or verbal interactions between the teachers and the pupils,
focusing in particular on questions, answers and responses. The researchers noted that whilst whole-class teaching increased, potentially valuable group work decreased. An increase of five minutes per lesson in whole class teaching was balanced by a drop of five minutes in group work, a trend which became more pronounced during observations the second year. Other changes due to IWB use were also noted, including significant increases in the number of open questions and answers from pupils, although these answers tended to be briefer than in non-IWB lessons. Smith, Hardman and Higgins (2006) find no basis for believing that teachers’ fundamental pedagogies have changed.

b) Interactivity

Despite the statement by Becta that ‘Interactive whiteboards are by their very nature interactive, and this interactivity extends and develops the teaching styles that teachers have traditionally used’ (2006b, p.1) it does not necessarily follow that this piece of technology will promote interactive teaching and learning; it is dependent on how teachers utilise the technology within their lessons. By virtue of its name, an IWB carries expectations of interactivity and the introduction of this device into the classroom has raised the issue the nature of interactivity in the classroom. Consequently, an exploration of the concept of interactivity in relation to IWBs is important for an understanding of the affordances and constraints of IWBs.

Researchers and commentators contribute different views on what interactivity means in regard to IWBs. Glover, Miller, Averis and Door (2005) believe that interactivity should be the goal of IWB use. They see this interactivity as having two dimensions: firstly, the interaction between people, e.g. pupil and pupil; secondly, the interplay of the multimedia elements. Kennewell, Tanner, Jones and Beauchamp (2008) note the difficulty researchers have in defining interactive teaching, but their literature review suggests it centres on student participation and autonomy in learning. They refer to a typology of interactive teaching constructed by Hargreaves, Moyles, Merry, Paterson, Pell and Esarte-Sarries (2003) who analysed definitions of interactivity given by primary school teachers. They then created a list of nine categories, which are further categorised into two ‘forms’ (Hargreaves et al., 2003, p. 225):
Surface forms
- Engaging pupils
- Pupil practical and active involvement
- Broad pupil participation
- Collaborative activity
- Conveying knowledge

Deep forms
- Assessing and extending knowledge
- Reciprocity and meaning making
- Attention to thinking and learning skills
- Attention to pupils’ social and emotional needs/skills.

This designation of interactivity into surface and deep forms is a recognition not only of the different types of interactivity that might be found in teaching and learning, but also of the different levels of interaction. This emphasises that interactivity, as a concept within teaching and learning, is complex and multifaceted. There have been various attempts to distinguish the types of interactivity that relate particularly to IWBs. Within their critical review of the literature on IWBs, Smith et al. (2005) draw a distinction between the ‘technical interactivity’ that occurs between the IWB and its user and the ‘pedagogic interactivity’ which focuses on the teaching strategies used. They see great potential in the ‘intersection’ (Smith et al., 2005, p.99) between these two types of interactivity to support ‘collective meaning making through both dialogic interaction with one another, and physical interaction with the board’ (ibid.). In the main, it is pedagogical interactivity that is the focus of studies on IWB use (Kennewell et al., 2008).

This bipartite view of IWB interactivity is further developed by Jewitt, Moss and Cardini (2007) who pinpoint three categories of interactivity related to IWBs:
- technical (engaging with the technological elements of the IWB)
- physical (working at the board and manipulating it)
- conceptual (engaging with the learning concepts and ideas).
Whilst many practitioners assume that physical interaction is the key to interactivity when using the IWB, Jewitt, Moss and Cardini (2007) rightly note that coming up to the board is not necessarily effective interaction. Rather, conceptual engagement should be the main aim of interactivity, and they cite an example to illustrate the classroom that strives for conceptual interactivity, which includes the following features:

- the IWB is used to promote discussion
- texts were displayed as prompts for exploration
- the teacher encouraged both physical and verbal participation
- the IWB was used to collate students’ ideas and thinking
- peripheral devices are used by both students and teacher to control the IWB
- the teacher is not always positioned next to the board.

The IWB was not used solely a means of transmission – of providing information and notes to be copied by students – but it had a significant role as a place for teacher and students to create texts together.

In their study of IWB use in secondary core subjects, Moss et al. (2007) found that conceptual or cognitive interactivity was actually quite rare. The irony is noted that in ‘pursuit of interactivity’, teachers ask students to operate the IWB and thereby perpetuate the ‘spectator mode’ effect of the IWB (Jewitt, Moss and Cardini, 2007, p.313).

What emerges from such studies, and particularly from the example of the lesson given by Jewitt, Moss and Cardini above, is that the use of interactive technology is dependent on the pedagogy and approaches employed by the teacher. The importance of the pedagogic approach is recognised by Beauchamp and Kennewell (2010) who explore the relationship between interactive technology and interactive teaching within an interactivity analysis framework. They use five categories of interaction (none, authoritative, dialectic, dialogic, synergistic) and map these against three types of interaction that take place within a lesson: whole-class, group and individual. Table 2.1 derives from Beauchamp and Kennewell’s framework. It focuses
on whole-class interaction. Column one shows the five categories of interaction and column two summarises the nature of the interaction. The final column has been added by this researcher, to provide examples of how IWB use might contribute to the interactivity.

<table>
<thead>
<tr>
<th>Category of interaction</th>
<th>Whole-class interaction: teacher-student</th>
<th>Examples of how IWB might support interactivity</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>Lecture/ demonstration by teacher</td>
<td>Presenting prepared slides of information</td>
</tr>
<tr>
<td>Authoritative</td>
<td>Funnelling questioning by teacher</td>
<td>Presenting prepared tasks with fixed answers, e.g. matching or sequencing activities</td>
</tr>
<tr>
<td>Dialectic</td>
<td>Probing questioning by teacher</td>
<td>Having prepared links to materials, to be accessed in reaction to students’ responses</td>
</tr>
<tr>
<td>Dialogic</td>
<td>Focussing dialogue and uptake questioning by teacher</td>
<td>The IWB can be used to explore and evaluate a website</td>
</tr>
<tr>
<td>Synergistic</td>
<td>Questioning and critical responses by teacher and students</td>
<td>The IWB is the place for students and teacher to jointly contribute, consider and evaluate ideas.</td>
</tr>
</tbody>
</table>

Table 2.1: Categories of technology interaction, derived from Beauchamp and Kennewell (2010, p.762)

What this framework does is to reinforce that the nature of any interactivity seen within a lesson is determined by the pedagogy and not by the technology. Therefore, it is the level of interaction established by the teacher that determines the IWB’s contribution to the interactivity generated within a lesson. As Beauchamp and Kennewell state ‘the teacher is the key to successful learning’ (2010, p.765). What is also clear is that interactivity does not just happen; it must be devised or orchestrated: ‘Orchestration is a conscious and contingent arrangement, dynamic rearrangement, and emphasis of these elements [of a lesson] and their affordances in order to facilitate the achievement of goals’ (Beauchamp and Kennewell, 2010, p.760).

Therefore, the realisation of interactivity within a classroom requires a deliberate and controlled manipulation of all the classroom resources, including the IWB. The ‘prevalence of relatively superficial interactions’ (Beauchamp and Kennewell, 2010, p.759) associated with IWB use will only change when users begin to develop a more thorough and nuanced understanding of what interactivity means in regard to IWBs.

The realisation of deeper forms of interactivity within the classroom requires more than the introduction of supportive technology; it necessitates that teachers have time
to reflect on their practice, in order to develop both a deeper understanding of what interactivity means in the classroom and the skills needed to achieve it.

c) Pace

In a guide to using IWBs in secondary schools, Becta (2004) state that the technology has the potential to increase the pace of learning by allowing a teacher, for example, new opportunities to present, quickly change and re-present information. When researchers and commentators discuss pace, they refer to aspects such speed, efficiency, the proportion of time spent on different lesson components and transitions between episodes of a lesson (Wood and Ashfield, 2008; Jewitt, Moss and Cardini, 2007; Smith, Hardman and Higgins, 2006; Smith et al., 2005). The ability to quickly access digital resources (e.g. a webpage) and to prepare teaching resources (e.g. PowerPoint slides) facilitates the potential for fast-paced lessons. This produces the effect of efficient and fluent lessons (Smith et al., 2005).

However, some studies warn about the danger of overwhelming learners with information in a fast-paced, dynamic environment (e.g. Moss et al. 2007; Schmid 2005). The implication is that the increased pace of lessons, the additional content and the ‘seamless presentations’ (Schmid, 2005, p.160) may lead to learners being spoon-fed and becoming spectators. Moss et al. (2007) observe that software such as PowerPoint can be used to frame or structure the lesson, with a linear sequence of slides. They note that the ease of progress allowed by PowerPoint presentations, in particular, can facilitate a teacher navigating through a great deal of information at a rate faster than some of the pupils can manage and understand. Teachers may appreciate the increase in pace but the speed of the process can prevent learners from developing higher order thinking skills (Wood and Ashfield, 2008). The positive aspect of being able to present ready-prepared resources can be lost if the presentation of the material does not allow learners enough time to consider and deliberate on the information. Using an IWB to inject pace into a lesson may also be used as a strategy for behaviour management with a teacher maintaining a fast pace so pupils do not have time to go off task (Moss et al., 2007).
Differences in pace have been noted between different subject areas. Smith, Hardman and Higgins (2006) observed an increase in pace in primary lessons over a two-year period, noting that the increase in pace was more marked in numeracy lessons than literacy lessons. Moss et al. suggest that differently paced lessons might be appropriate for different subjects: “fast pace’ seems particularly appropriate when teaching some aspects of Maths. It has a less immediate application to substantive areas of English teaching’ (2007, p. 43). If pace is not necessarily an advantage to an English teacher, awareness of whether, when and how to use the IWB to inject pace is clearly an important development issue for English teachers. As has been noted above, pedagogic considerations should direct the pace within a lesson.

2.4.3 The effect on the learner

Motivation

In their review of the literature on IWBs, Smith et al. note that the ‘most widely claimed advantage of IWBs is that they motivate pupils’ (2005, p. 96). This strong motivational effect is ascribed to the enhanced presentational and visual aspects of the board (e.g. Glover et al., 2005; Smith et al., 2005). Hall and Higgins (2005), in a study that focuses squarely on the pupils’ perceptions of IWBs, reveal that pupils like the versatility and variety enabled by IWBs, as well as multimedia use and the use of fun and games. A strong impact on engagement is found across age groups from mature English language learners (Schmid, 2008) right down to Foundation Stage (Somekh et al., 2007). Generally, primary school pupils are ‘universally enthusiastic’ about IWBs (Somekh et al., 2007, p. 4), regarding IWBs as an aid to learning, helping concentration, understanding and visualisation: ‘They repeated say how much they like ‘being able to see’.’ (ibid.). Learners like the multimedia access provided by the technology. In their primary school case study Wood and Ashfield record one student teacher commenting how the pupils like the bright and colourful aspects of the IWB
‘especially if it moves or makes a sound’ (2008, p. 91). There is a danger perhaps here, of the ‘bells and whistles’ effect of flashy but essentially empty lesson content.

Moss et al. note that although the technology was initially welcomed by pupils, ‘any boost in motivation seems short-lived’ (2007, p.4). Beauchamp and Parkinson (2005) discuss teachers and pupils moving beyond the ‘wow’ factor, a position echoed by Somekh et al. (2007) who agree that after an 18-24 month period the ‘wow’ factor may fade but nevertheless the positive effects of the IWB do not. Torff and Tirotta (2009) were concerned that much of the early evidence on IWBs tended to be small scale or anecdotal in nature and so conducted their own quantitative research focused on US schools, focusing specifically on motivation. At the heart of their research was a student survey of five items (using Likert scale responses), asking students (4th, 5th and 6th grade) to self-report their levels of motivation about mathematics. The survey was conducted with treatment and control groups, to enable comparison between the two. Their study found higher levels of motivation in the treatment group with IWBs, but found ‘the effect was extremely weak’ (Torff and Tirotta, 2009, p.1) They believe their findings show the assertion that IWBs improve motivation may be overstated.

Learner attitudes

The openness of many young people to digital applications makes them keen to use IWBs. However, as Laurillard points out, ‘Our digital native students may be able to use technologies, but that does not mean they can learn from them’ (2013, p.xvii). Indeed, because of the potential for IWBs to imitate other digital media, learners may not adopt an ‘educational’ approach to their use. For example, children used to playing computer games on consoles and similar, may employ the same strategies when using educational game so that gaming conventions, like finishing as quickly as possible, take precedence over the learning (Somekh et al., 2007). Schuck and Kearney’s study of IWBs in an Australian context, noted that the students were often the driving force behind getting teachers to use IWBs and that the IWB provided ‘a bridge into the digital world’ for both teachers and students (2007, pp.5-6). Students can become frustrated, however, by technical difficulties or by teachers or other pupils
being unskilled with the technology and software, by recalibration issues and by difficulties in seeing the board because of sunlight, for example (Hall and Higgins, 2005; Somekh, et al., 2007).

Schmid (2006), working with mature, English language students, perceived a division between the teacher and the students in their views of IWBs. Whilst the teacher wanted to use it in traditional ways, the learners saw the IWB as more of a computer than a display board and want to use it to share, collaborative and go beyond traditional pedagogy. They saw its capacity to transform teaching, although they did regard the IWB with varying degrees of comfort. Whilst some wanted to use the IWB as a catalyst for collaboration and the sharing of learning, others were threatened by exposing their possible ignorance via the IWB, preferring instead the anonymity afforded by the board (e.g. through voting systems). Primary school pupils, too, can experience a possible exposure threat when teachers shared results on the IWB (Somekh et al., 2007). Younger learners, however, are keen to take a turn on the board although the same may not be true for teenagers. Moss et al (2007) confirm that a sizable minority of the secondary pupils they studied disliked going out to the board, although individuals can respond well, as when one case study reported on a ‘challenging pupil’ responding positively to the invitation to use the IWB (Armstrong et al., 2005, p.466).

Use of IWBs with different types of learner

Barber, Cooper and Meeson (2007) suggest that IWBs may be of particular use to learners with special educational needs (SEN) and positive effects have been observed in some studies (Schuck and Kearney, 2007, and Somekh et al., 2007). Somekh et al. (2007) note that IWB use heightens the engagement of Key Stage 1 primary children with SEN, and also leads to improved behaviour. However they also note that ‘The many advantages that sighted children enjoy when interactive whiteboards are used are denied to blind children who need to have a running ‘translation’ of the interactive whiteboard’s display’ (Somekh et al, 2007, p.6). Interestingly, researchers in Brazil are addressing this issue and have been working on mediation software to provide
descriptions of board content to blind students during the lesson (Freire, Linhalis, Bianchini, Fortes and Pimentel, 2010). In a case study within a special school for deaf children, Carter (2002) reveals how well profoundly deaf children respond to working with an IWB. She points out the difficulties involved in the division of attention between a PC screen and a teacher. The IWB eliminates this difficulty: ‘the children can gather around one large screen and be completely involved in what they need to do and learn’ (Carter, 2002, p.10). Another case study looks at how IWB use can support learners with autistic spectrum disorders (Egerton, Cook and Stambolis, 2009). The study reveals that the IWB is particularly appealing to learners with autistic spectrum disorder who often favour computer technology and strongly visual learning, although careful creation and orchestration of the resources on the IWB is needed for learners with often complex needs. A further study exploring IWB with autistic learners revealed that IWBS supported the learners’ skills acquisition, in a study which highlighted the value of the IWB when used as a learner-operated (as opposed to teacher-operated) device (Yakubova and Taber-Doughty (2013). The examples given here show practitioners giving particular thought to working creatively and innovatively with IWBS to help meet the requirements of students with very particular learning needs. They are perhaps exploiting the affordances of IWBS in different ways to mainstream teachers.

There is relatively little information available about the effects of IWBS on learners with regard to gender. At Key Stage 2, Somekh et al. (2007) found positive trends for both boys and girls in mathematics, a marked effect for low-attaining boys in science and a positive impact with boys with low prior attainment in English (writing). In their extensive study of IWBS in secondary schools, Moss et al. (2007) do not focus on gender, but they do consider ability, showing that in English lessons, teachers are far more likely to use IWBS in lessons for low ability students than for high ability students. Interestingly, Moss et al. (2007) report that whilst both higher and lower groups tend to have positive attitudes to IWB use, in general the higher ability students have more enthusiasm for IWBS.
The IWB is often conceived of as a whole-class tool. This section reveals that users also need to develop an awareness of IWB use with particular groups of students, who may respond differently to IWB use, and who may benefit from different types of IWB use. The implication is that the principles and strategies for IWB use are probably more nuanced and subtle that the traditional whole-class approach suggests.

2.4.4 The effect on learning

In referencing the literature, there is an overwhelming sense that learners like IWBs and that IWBs boost engagement and motivation, but the key question must focus on how the use of IWBs affect the learning. Without doubt they have an impact, just like any other resource brought into the classroom but do they have a positive effect and do they enhance the learning process?

Within the literature, there is a lack of evidence to show improvement in attainment. In their 2006 Review, Becta noted that the evidence for improved attainment is inconclusive (Becta, 2006a). Later studies are still cautious but show more positive trends. The Evaluation of the Primary Schools Whiteboard Expansion Project (2007) analysed attainment in the three core subject areas at KS1 and KS2. Positive effects were seen across both key stages for maths, science and English, though in differing degrees according to ability and gender; they appeared to be less marked and conclusive for English than the other subjects (Somekh et al., 2007). An evaluation of the impact of IWBs in London secondary schools, which also focused on core subjects, found no evidence of increased performance in the year 2004-05 (Moss et al., 2007). Some positive effects were found in English but they were either small, not consistently established or the cause could not be definitely ascribed to IWBs. Moss et al. (2007) considered this lack of impact in line with the schools’ stage of development in using IWBs. Time is undoubtedly a factor in the embedding process for IWBs: ‘the length of time pupils have been taught with an interactive whiteboard is the major factor that leads to attainment gains’ (Somekh et al., 2007, p.4).
Lopez (2010) notes the lack of empirical research on how IWBs affect students’ learning. In the first year of a study of a US project designed to ascertain whether and how the use of IWBs can help to reduce the gap in performance between English Language Learners (ELL) and regular learners in the 3rd and 5th grades, Lopez conducted a series of analyses on two main data sets relating to students’ performance in mathematics and reading. The research concludes that the results ‘strongly suggest’ that performance parity was achieved between ELL students in classrooms with IWBs and those in a traditional classroom (Lopez, 2010, p.910). Indeed, ‘reverse parity’ (ibid.) was achieved in 5th grade reading, where the performance of ELL students with access to IWBs exceeded that of regular students.

The use of IWBs to support collaborative learning is considered in another English language teaching context. Schmid (2005), researching with adult learners, noted that the IWB enhances collaboration. In particular, it makes, making thinking visible in lessons. Within Schmid’s study group of older learners, the students comment on how the use of the IWB creates a strong group focus on some activities, with one student commenting that its strength is to ‘support group cohesion’ (Schmid, 2005, p.189).

Smith, Hardman and Higgins (2006), in their study of teacher-pupil interactions in 12-15 primary schools, found the nature of discourse changed in lessons using an IWB, with significantly more open questions, probes (taking questions further), repeat questions, evaluation and answers from pupils.

Collaboration is investigated by Haldane through an analogy of the ‘fabric of learning’: ‘learning is about making connections; joining together threads of thought and threads of tacit knowledge with new knowledge’ (Haldane, 2007, p.263). She maintains that a key element of the teacher’s role is to allow these connections to take place, and that the IWB can support this process. The IWB allows the teacher and the learner to jointly consider the threads of existing knowledge and new learning threads. It also facilitates the ‘interaction between the teacher’s unstable or transient spoken symbol system and the IWB’s stable symbol system’ (Haldane, 2007, p.268). The teacher’s ‘unstable’ or ‘transient’ symbol system may include verbal responses, body language and expression and this is contrasted with the stability of the resources on the board. So
the IWB supports learning by providing the opportunity for collaboration, for making connections and for lessening the transient aspects of learning.

2.5 Multimedia: supporting pupils’ learning

The IWB is accepted as a multimedia resource, but what does multimedia mean, particularly with regard to learning? In relation to computer applications multimedia refers to the incorporation of audio and video ‘especially interactively’ (Oxford Dictionary of English, 2010, p. 1164), and in relation to learning multimedia learning means ‘learning from words and pictures’ (Mayer, 2009, p.5). The author of the cognitive theory of multimedia learning (CTML), Mayer, provides a very helpful perspective for considering the nature of the IWB as a multimedia resource.

Mayer seeks to explore and explain the processes of multimedia learning, through introducing his theory (Mayer, 2005) and thereby hopes to develop understanding into how to successfully design multimedia learning opportunities (ibid.). His theory references other theories, most notably Sweller’s cognitive load theory (CLT). CLT builds on an assumption of human ‘cognitive architecture’ (Sweller, 2005, p.26) where the powerful long-term memory and limited working memory work together to create a change in the long-term memory: ‘Learning is defined as an alteration in long-term memory. If nothing has altered in long-term memory nothing has been learned.’ (Sweller, 2005, p.20). Learning takes place through ‘schema construction’ (Sweller, 2005, p.21) where information is processed and categorised over a period of time in the long-term memory. Acquiring a schema and then practising using that schema leads to automation. For example, when learning to read an individual may develop schema relating first to individual letters, then to words and then to whole texts. A great deal of practice in using these schemas leads to an automated, unconscious process (ibid.). The cognitive load refers to the load exacted on the working memory. Sweller defines three types of cognitive load:

- extraneous cognitive load refers to poor designs that overload the working memory or which fail to help the learner to focus on the necessary schema
• *intrinsic cognitive load refers* to the inherent difficulty of the information being considered
• *germane cognitive load is created by providing* an effective learning design in place which provide focus and support to access schemas (Sweller, 2005).

Mayer (2005) builds on the concept of cognitive load and bases his own theory of multimedia learning on three principles:

• the dual channels assumption
• the limited capacity assumption
• the active processing assumption.

The first of these – dual channels – proposes that two channels feed information into the working memory: a visual/pictorial one and an auditory/verbal one. Effective instruction/learning will utilise both of these channels. However, as was noted in Sweller’s theory, the capacity of the working memory is limited and the limited capacity assumption recognises the need to constrain the input via the dual channels. The active processing assumption suggests that learners must process the material that enters the working memory in order to create a ‘coherent mental representation’ (Mayer, 2005, p.36). This theory indicates that the concept of multimedia learning is not as straightforward as it might appear at first sight. Mayer’s own definition of ‘learning from words and pictures’ (Mayer, 2009, p.5) belies the complexity of a process that needs explicit and careful planning. An exploration of the IWB as a multimedia resource needs to acknowledge this position.

The multimedia capacity of the IWB is immediately obvious. Not only is it a medium in its own right – a large touch-sensitive presentational device – but it is also a conduit for using and viewing other media such as computer programs, webpages and videos. This means that, potentially ‘IWBs offer a bewildering variety of functions’ (Wheeler, 2008, p.47). English, as a subject, presents the opportunity to exploit multimedia opportunities in teaching. Using the example of poetry, Warren, Millum and Rank proffer an example of multimedia opportunities: ‘Poetry is multimedia by nature: it interacts with other art forms’ (2011, p.5). They go on to suggest that using ICT with
poetry encourages the combination of ‘words with images, with movies – cartoons and films. It facilitates composition of music and makes arranging images in special sequences an easy task. It also helps with the final production or presentation.’ (Warren, Millum and Rank, 2011, p.6) They suggest that ICT is relevant to the whole process.

However, there is complexity involved in utilising the IWB as a multimedia resource, as is indicated by the time it takes to become proficient in using the technology. In the Evaluation of the Primary Schools Whiteboard Expansion Project, a report on the use of IWBS in primary schools in twenty-one local authorities, it was estimated that it takes a period of around two years sustained use for a teacher to become an effective user of an IWB (Somekh et al., 2007). This piece of technology, therefore, requires an investment of time and effort on the part of the teacher using it.

Successful utilisation of this technology not only means being able to access and manipulate multimedia resources but, as has already been noted, the design of the learning and the resources is another very significant element. As stated above (Chapter 2.4.2), there is a tendency for teachers to design their own resources, and not always with clear design principles being used (Moss et al., 2007). In a study of the three core subjects, English teachers were noted as those teachers mostly likely to experience difficulty in accessing IWB resources (Moss et al., 2007), which may indicate that they are most likely to design their own resources and they therefore need to have an explicit awareness of multimedia design principles. In her study of English language learners, Schmid notes that there were students who felt they were ‘bombarded with too much information and in too many ways’ (2008, p.1564). This suggests that teachers need to be aware of the amount and ranges of content, if they to avoid ‘cognitive overload’ (ibid.). The multimedia environment is complex, and further study and research is required on the most effective way to use multimodal texts with an IWB. Providing insight to the multimedia role of IWBS in English, particularly in terms of the IWB content and design, is an important element of this study.
2.6 TPACK: focusing on teachers’ learning

The cognitive theory for multimedia learning provides a framework for considering the contribution of IWBs to supporting pupils’ learning. However, IWBs also present substantial learning challenges to teachers, as the increasing availability of digital technology in schools makes demands on their professional development. This section considers a framework for focusing on the nature of teacher learning with regard to IWB technology.

2.6.1 An introduction to TPACK

Traditional technologies, such as pencils or static whiteboards, tend to be characterised by stability and specificity of use; their uses are generally clear and well-established (Koehler and Mishra, 2009, p.61). However, digital technologies, such as the personal computer or the handheld tablet, may be regarded as ‘protean, unstable and opaque’ (ibid.). They often offer extensive, multiple and changeable functions and opportunities, and such diversity and breadth of functions present new challenges to teachers (ibid.). The IWB, as a technology in its own right and as a conduit for other technologies (for example, the Internet, video, specialist programs), facilitates a vast number of affordances. Consequently, this is not a technology that can just be adopted; rather, teachers must learn and develop the knowledge, understanding and skills necessary to work effectively with this technology. For example, a teacher planning to use an IWB must take account of a range of considerations, including what programs and applications are available, how to operate the IWB and its tools, what subject content to use on the IWB, how to present teaching concepts and ideas, who should use the IWB and at what stage in the learning it might be used. The learning demands on teachers working with this technology are complex and extensive.

Mishra and Koehler (2006) have developed a construct for considering how teachers integrate technology into their teaching. The technological pedagogical content knowledge (TPACK) framework focuses on the ‘interdependent aspects of teachers’ knowledge necessary to teach content-based curricula effectively with educational technologies’ (Harris, Mishra and Koehler, 2009, p.393). Koehler and Mishra consider
that teaching is an ‘ill-structured discipline’ requiring the application of ‘complex knowledge structures across different cases and contexts’ (2009, p.61). Introducing complex digital technology further complicates the challenges presented to teachers. Effective integration of technology is dependent on the demands of a specific subject and the individual teaching context (Koehler and Mishra, 2009). Koehler and Mishra postulate that ‘At the heart of good teaching with technology are three core components: content, pedagogy, and technology, plus the relationships among and between them’ (2009, p. 62). These three knowledge bases – content, pedagogy and technology – provide the foundation of their framework.

### 2.6.2 The TPACK framework

Koehler and Mishra’s model builds on the ideas of Shulman (1986) who considered the complex nature of teacher knowledge and introduced the concept of pedagogical content knowledge (PCK). PCK appreciates the interrelatedness of content and pedagogy. It refers to the content of a subject which relates to teaching of that subject, for example ‘the most powerful analogies, illustrations, examples, explanations, and demonstrations’ that are used by teachers (Shulman, 1986, p.9). By adding technological knowledge to this model, the interconnected nature of the three knowledge bases is acknowledged. Mishra and Koehler reject a ‘simple view of technology’ (2006, p.1025) where technology is viewed as a self-contained set of knowledge and skills to be grasped by teachers. Instead, they develop a model which recognises that ‘technologies often come with their own imperatives that constrain the content’ (ibid.) and their model acknowledges the ‘complex interplay’ (ibid.) of content, pedagogy and technology (see Figure 2.3). This view recognises that technological considerations can affect both the content and the pedagogical decisions made when planning and delivering teaching and learning.

Figure 2.3 shows that the framework is based on three main knowledge bases: content, pedagogy and technology. Equally important to the framework are the intersections between the bodies of knowledge: pedagogical content knowledge, technological content knowledge, technological pedagogical knowledge and technological pedagogical content knowledge (Koehler and Mishra, 2009). These
components of teacher knowledge are situated or bounded within a specific teaching context. Table 2.2 provides a summary of the seven types of knowledge depicted in the framework. This integration of content, pedagogy and technology is what ‘expert teachers bring into play any time they teach’ (Koehler and Mishra, 2009, p.18). It is a form of knowledge that teachers need to be able to ‘flexibly navigate’ (ibid.) if they are to utilise technology effectively with specific teaching contexts.

<table>
<thead>
<tr>
<th>Components</th>
<th>Brief Description</th>
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<tbody>
<tr>
<td><strong>Content knowledge</strong></td>
<td>Teachers’ subject knowledge about the subject being taught, including concepts, facts and theories.</td>
</tr>
<tr>
<td><strong>Pedagogical knowledge</strong></td>
<td>Knowledge of teaching and learning processes and practices. Understanding of learning, planning, assessment and classroom management.</td>
</tr>
<tr>
<td><strong>Technological knowledge</strong></td>
<td>Understanding and mastery of the use of programs and applications for information processing, communication and problem solving.</td>
</tr>
<tr>
<td><strong>Pedagogical content knowledge</strong></td>
<td>Adaptation and transformation of subject content for teaching.</td>
</tr>
<tr>
<td><strong>Technological content knowledge</strong></td>
<td>Understanding the relationship between content and technology, and how content can be changed by technology.</td>
</tr>
<tr>
<td><strong>Technological pedagogical knowledge</strong></td>
<td>Understanding the influence of technology on teaching and learning processes.</td>
</tr>
<tr>
<td><strong>Technological pedagogical content knowledge</strong></td>
<td>Understanding of the interaction between content, pedagogy and technology, and the pedagogical techniques that allow content to be effectively taught using technology.</td>
</tr>
</tbody>
</table>

Table 2.2: A brief description of the components of TPACK (derived from Koehler and Mishra, 2009)
Content knowledge refers to the knowledge teachers have about the specific subject being taught. In the case of English teaching, this might denote knowledge, for example, of a writer, a text, a genre, grammatical rules or writing conventions. Pedagogical knowledge relates to a teacher’s knowledge of how to transfer content knowledge to a learner, so promoting learning. It refers to the body of knowledge developed by teachers on how learners learn and the teaching methods that can bring learning about. This might include, for example, knowledge of learning theories, strategies to support reading or assessment techniques. Pedagogical content knowledge is the conceptualisation, originally put forward by Shulman, of knowledge ‘which goes beyond knowledge of subject matter per se to the dimension of subject matter knowledge for teaching’ (1986, p.9). This is the knowledge that recognises such aspects in teaching content as what the key ideas are, what examples support the teaching and what the potential misconceptions might be.

Introducing technology adds a layer of complexity to Shulman’s conceptualisation of teacher knowledge because ‘technology knowledge is always in a state of flux’ (Koehler and Mishra, 2009, p.64). Technology knowledge, therefore, requires that teachers have a broad and developing understanding of the uses and value of technologies. In the case of IWBs, this might refer to aspects such as understanding the hardware, knowledge of how to operate the IWB and knowledge of the programmes and applications. Technological content knowledge refers to the relationship between content and technology, and the manner in which technology and content ‘influence and constrain one another’ (Koehler and Mishra, 2008, p.16). An example of knowledge of technological content on IWBs for teaching English might be showing a video relating to trench warfare whilst studying World War One poetry. It is therefore important for teachers to understand how subject content can be influenced by technology. Just as content can be influenced by technology, so can pedagogy. Technological pedagogical knowledge is the knowledge of how teaching and learning can be altered by technology. This might be exemplified within English teaching by the use of PowerPoint slides/animation to help break down a poem by showing individual lines of the poem. Technological pedagogical knowledge requires
that teachers understand the affordances and constraints of the technologies to which they have access (ibid., p.17).

At the intersection of all three main components in the TPACK framework is *technological pedagogical content knowledge*. Koehler and Mishra consider that this form of knowledge ‘goes beyond’ the individual components and underlies ‘truly meaningful and deeply skilled teaching with technology’ (ibid., p.17). In the case of English teaching, this type of knowledge might be demonstrated by a teacher who models the analysis of an advertisement on the IWB and then prints it out for learners to study further. In such a case, the teacher is using knowledge of all three components of the framework: content (projecting the advertisement in a large format on the IWB), pedagogy (modelling to the whole class) and technology (using the IWBs tools to annotate and print). However, by blending this knowledge together in the one teaching strategy, the teacher provides a model of the technique for learners and an example of the type and quality of work required. This model has been created in front of the whole class, and possibly with the help of the whole class, and so develops the knowledge of the class. The act of printing out the annotated work captures the work done in the lesson, making the learning more tangible, and enables the learners to revisit the exact model created in class, which would not be possible without the use of the technology. Teachers therefore need to master *technological pedagogical content knowledge* in order to integrate technology successfully into their teaching.

### 2.6.3 TPACK and IWB use

The model presented by Mishra and Koehler allows that technology can be successfully integrated through the ‘thoughtful interweaving’ (2006, p.1029) of technology, pedagogy and content. A transactional relationship exists between these elements in which ‘a change in one of the factors has to be “compensated” by changes in the other two’ (ibid., p.1030). Such compensation is particularly evident when teachers adopt new technologies, and they are challenged on questions of content and pedagogy, a process that can ‘overwhelm even experienced instructors’ (Mishra and Koehler, 2006, p.1030). The teacher has the critical role in the implementation of
the technology as it is the teacher who acts as the ‘curriculum designer’ (Koehler and Mishra, 2008, p.21). The teacher’s (TPACK) knowledge will determine the efficacy of teaching and learning using an IWB. Knowing how to operate the technology is not enough on its own. Nor is it sufficient to focus on the content of the IWB. The teacher must be equally cognisant of content and pedagogy, as well as technology, and the interrelated areas between these components.

The application of the TPACK framework in this study allows for a consideration of these bodies of knowledge within the cases of the sample teachers. The data collection methods provide a focus on each of these areas, and thereby offer insight into the teachers’ professional development in using IWBs to teach English.

2.7 The uses and functions of an IWB

Examining the uses afforded by IWBs in secondary English classrooms is a significant aspect of this research, and therefore it is necessary to establish a structure for examining how the IWB is being used in English. Studies of IWB use have found different ways of listing the uses observed (across English and other subjects). Drawing on findings from eighteen teachers in four primary schools Cogill notes eight ‘common factors’ and six ‘higher-order pedagogical whiteboard skills’ (2003, p.3) (Table 2.3).

<table>
<thead>
<tr>
<th>Common uses</th>
<th>Higher-order uses</th>
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<tbody>
<tr>
<td>• Providing teaching structure</td>
<td>• Saving work to access later</td>
</tr>
<tr>
<td>• Saving time scribing</td>
<td>• Collaborative work between pupils and teacher</td>
</tr>
<tr>
<td>• Providing a large display</td>
<td>• Adapting resources to suit particular needs</td>
</tr>
<tr>
<td>• Demonstrating skills</td>
<td>• Providing images to be adjusted by children to display their own work</td>
</tr>
<tr>
<td>• Attracting attention</td>
<td>• Fostering independent thinking skills</td>
</tr>
<tr>
<td>• Providing access to texts not otherwise easily accessed</td>
<td>• Pupils creating their own multimedia presentations</td>
</tr>
<tr>
<td>• Whole-class tests/quizzes</td>
<td></td>
</tr>
<tr>
<td>• Children writing their answers on the board</td>
<td></td>
</tr>
</tbody>
</table>

Table 2.3: Uses of the IWB noted by Cogill (2003)
These uses can be seen to fall into four broad categories: supporting the learning process (e.g. collaborative work); promoting engagement (e.g. attracting attention); accessibility (e.g. providing a large display) and facilitating teaching processes (e.g. saving time scribing). It is noticeable that the uses of the IWB extend beyond direct engagement in learning.

Schuck and Kearney (2007) writing about their qualitative study of IWB use in an Australian context, describe over forty uses of the IWB in six K-12 (primary and secondary) schools. They provide pen-portraits of over forty lessons, describing the use of the IWB in each lesson. The lessons include descriptions of seventeen English/literacy lessons and, whilst there is no attempt to categorise the use of the IWB in these lessons, the following typical uses emerge:

- modelling texts and skills
- collaborative writing
- students completing tasks (e.g. text completion)
- analysis of texts
- editing texts
- brainstorming ideas/words
- using commercial programs
- promoting discussion.

The main pedagogical approach observed was of whole-class interaction with teachers predominantly using the IWB for presentation and instruction.

In an OECD Education Working Paper, providing an overview of IWB technology in education, Hennessy and London suggest twenty possible ‘actions’ with IWBs (2013, p.7) listed in Table 2.4. Whilst these ‘actions’ are listed in relation to the whole curriculum, they all have obvious relevance for English teaching.
Table 2.4: Actions associated with IWB use (Hennessy and London, 2013)

<table>
<thead>
<tr>
<th>Composing</th>
<th>Apprehending</th>
<th>Sharing</th>
<th>Revisiting</th>
</tr>
</thead>
<tbody>
<tr>
<td>Editing</td>
<td>Focusing</td>
<td>Annotating</td>
<td>Undoing</td>
</tr>
<tr>
<td>Selecting</td>
<td>Transforming</td>
<td>Repeating</td>
<td>Questioning</td>
</tr>
<tr>
<td>Comparing</td>
<td>Role Playing</td>
<td>Simulating</td>
<td>Prompting</td>
</tr>
<tr>
<td>Retrieving</td>
<td>Collating</td>
<td>Cumulating</td>
<td>Responding</td>
</tr>
</tbody>
</table>

Some researchers have integrated the functions into broader categories. Moss et al. (2007) outline three main uses for IWBs: as a data projector; as a dynamic, as opposed to static, display and to enhance front-of-class presentation. The same report also uses three detailed case studies, from mathematics lessons, which illustrate the IWB being used in contrasting ways: as a traditional whiteboard; to display many pre-prepared resources at a fast pace and as focus for the class co-constructing the learning. Such case studies are helpful for understanding the range of ranges of practice and texts used, as well as appreciating the ‘pedagogic intent’ (Moss et al., 2007, p.33).

Kennewell synthesises the variety of roles performed by IWBs into four distinct characters:

- Consultant – a provider of information e.g. via the Internet
- Organiser – providing tight structures (e.g. games)
- Facilitator – providing loose structures (e.g annotation task)
- Repository – recording ideas for consideration later

(2006, pp.7-8).

Kennewell’s categories neatly synthesise the types of function performed by an IWB, although the notion of ‘agency’ implied by three of the roles (consultant, organiser, facilitator) is perhaps not conducive to a view which contemplates IWBs as merely
tools in the hands of a teacher. As has already been noted (Chapter 2.2), the IWB may be a catalyst to change, but it cannot bring it about by itself.

The categories and typologies of use noted above illustrate the ubiquitous nature of the IWB. Much of its value to the classroom is founded on its multifunctional nature. The categories of use employed within this study are as follows:

- Display and broadcasting
- Writing and annotation
- Manipulation
- Resource management.

They are informed by the categories already noted, and attempt to encapsulate the broad functions that IWBs might perform in English teaching and learning in a manageable but illuminating way. These categories are explained and explored below.

2.7.1 Display and broadcasting
The IWB is primarily a technology for broadcasting – for showing and sharing. This may be for written text, images, digital texts, media and ‘dynamic’ display (Moss et al., 2007, p.5), broadcasting sound, internet sites, software and games. The display or broadcast may be enabled by peripheral devices such as speakers and visualisers (a type of camera) and may be enhanced through special tools, e.g. for magnification and emphasis (Beauchamp and Parkinson, 2005). Moss et al. (2007) give a helpful breakdown of the types of texts they observed in use, including real-time texts (e.g. microscope), emergent texts and commercial texts, but noting in particular the predominance of teacher-prepared texts. Kennewell and Beauchamp (2007) note how teachers consider it is also a valuable way of sharing children’s own writing. The use of IWBs for a display and broadcasting function is an extension of existing technology (traditional whiteboards) in that it provides a clear focus area, mediated by the teacher, and so enhances front-of-class presentation (Moss et al., 2007).

2.7.2 Writing and annotation
The IWB also provides the capacity for writing and modifying texts, for example through pen, highlighter and keyboard (e.g. Beauchamp and Parkinson, 2005; Kennewell and Higgins, 2007). Such annotation might include annotation of images
and stills from videos as well as written texts. Moss et al. (2007) saw innovative practice as including the editing and annotation of short digital clips as well as real-time manipulation and annotation of texts. Beauchamp and Parkinson consider that by encouraging pupils to be part of this process ‘teachers are making the first moves towards using the board interactively’ (2005, p.99).

Text annotation is particularly important to English teaching. It is a key part of exploring a text (Dymoke, 2009) and a way in which to help students shape their responses to a text (Kress, Jewitt, Bourne, Franks, Hardcastle, Jones and Reid, 2005). Kennewell and Beauchamp (2007) in a small scale study of IWB use in primary core subjects, observed that one of the main subject differences was that whereas mathematics lessons used IWBs predominantly for the manipulation of number and shapes, a primary use for IWBs in English IWBs was the generation and amendment of texts. The Evaluation of the Schools Whiteboard Expansion (SWE) Project, in their study of the use of IWB in core secondary school subject areas, also observed that annotation of text was a typical use within English lessons (Moss et al., 2007).

2.7.3 Manipulation
Interactive whiteboards allow hands-on or kinaesthetic ways of working. Touch-screen technology means that through the use of finger and/or pen, items can be manipulated, moved and activated on the IWB. These actions can also be performed with remote devices. Specific software will allow actions such as drag-and-drop and hide and reveal functions (Kennewell and Higgins, 2007).

Studies show that the facility to manoeuvre and control items on screen by means of finger or mouse or pen control is considered by teachers particularly pertinent for less able pupils. Kennewell and Beauchamp noted that teachers felt it was important for the engagement of the less able in particular to call pupils up to the board ‘to interact with the material’ (2007, p.230). They also noted that ‘it was important that younger students were able to drag words and images as objects rather than having to write or
draw on the board’ (*ibid.*) so that they can engage with the ideas even when they do not have the requisite writing skills yet.

With secondary school students, the picture is slightly different. Moss *et al.* (2007) found that in core subject lessons for higher ability classes, students were less likely than pupils in lower ability groups to asked up to the board. Secondary pupils can also be unwilling to come out to the front, and when they do it can interfere with the pace of the lesson and the concentration of the class (Moss *et al.*, 2007). Pupil reluctance to come to the board was also observed in a small scale study of IWB in secondary science, focusing on using the IWB to foster learner participation in science (Hennessy *et al.*, 2007). They found that whilst pupil use of the IWB is seen by teachers as desirable, it was rarely seen in practice as teacher-led use actually predominated. Their research found that a number of external factors can affect pupils’ use of the board, including school systems, assessment frameworks and the subject culture (Hennessy *et al.*, 2007). The influence of different subject areas has been noted elsewhere. Kennewell and Beauchamp (2007), for example, completed a small scale research project into the impact of ICT on core subjects (English, mathematics and science) in an ICT-rich primary school in Wales, using lesson observations and follow-up interviews with six teachers in the school. As well as noting that the IWB was often used in English for generating and modifying text, and in mathematics for manipulating shapes and numbers, the researchers also observed that pupils in maths and English lessons were more likely to be invited to work at the board than pupils in science lessons.

### 2.7.4 Resource management

IWBs permit a greater degree of organisational capacity than traditional whiteboards, including the facility to collate and marshal materials prior to the lesson. Shenton and Pagett (2007), for example, in their research studying the use of IWB with six primary schools’ literacy lessons, noted the tendency for teachers to prepare screens prior to the lesson, including examples of pupils’ work. The resources may be saved ‘in either personal or shared areas on the school’s server’ (Somekh *et al.*, 2007,p.9).
The IWB itself provides the capacity for saving and storage of work, in that it allows files, documents and annotations to be saved, enabling teacher and pupils to refer back to the texts in a different place and/or a different time (Beauchamp and Parkinson, 2005; Kennewell and Higgins, 2007). Similarly, documents can be printed for further consideration.

Assessment is another aspect of the organisational capacity of IWBs, in that assessment activities, such as tests, quizzes and tasks, can be administered through using an IWB (Shenton and Pagett, 2007). Certain peripherals, such as voting pads, can bring an added dimension of immediacy and convenience in organising assessment in that learning can be assessed as soon as it has been completed by students, with very fast feedback of results to students and teacher, (Schmid, 2008).

### 2.8 Conclusion

In 1998, education technology journalist, Jack Kenny, marked the introduction of IWBs into the classroom by heralding a development that ‘leaves you lost for words’ and that ‘could bring about major change’ (Kenny, 1998). Twelve years later, he bemoaned the lack of progress in teacher practice. The expected change in the teacher’s role from ‘the sage on the stage’ – a dispenser of knowledge – to a ‘guide on the side’ - helping students navigate their own way through learning - had not happened (Kenny, 2010). Kenny’s observations reflect a view that IWBs have not brought about a transformation in teaching practice. Studies have shown that whilst there may be positive impacts, on motivation for example, that teachers tend to use IWBs to suit their traditional teaching methods. The expectation that technological development would, by itself, bring about transformation has proved to be unrealistic and unachievable. Technology by itself cannot bring about change. As Mercer points out, the IWB ‘has no powers of alchemy; it cannot transform poor pedagogy into good’ (2010, p.xv). The focus must therefore be on pedagogy and considering how IWBs can be incorporated into effective pedagogy.
Pedagogy refers to the discourse between teacher and learner (Cogill, 2010). Understanding how the IWB might support the people who use it (teachers and learners) and the processes they experience (teaching and learning) is an important step to understanding pedagogical change involving IWB use. This literature review shows that it takes time for teachers to adopt the technology, and they undergo recognised stages as they do so (Haldane, 2010; Hooper and Rieber, 1995). They need training to prepare them to use the technology proficiently and, importantly, to achieve effective learning. However, training which focuses on learning and pedagogy (as opposed to familiarity with the technology) appears to be rare (Moss et al., 2007), although this may be more marked at secondary than at primary level (Condie and Munro, 2007).

This literature review notes that, as the prime users of the technology, teachers have been observed to use the IWB to appropriate more control in the classroom (Gray, 2010), although again this may be a trend more prominent at secondary level (Somekh et al., 2007). Particular aspects of teaching affected by IWB use include planning, resource design, types of interaction with learners, interactivity and pace. This review has also sought to understand and categorise the typical uses of an IWB, as well as considering it as a multimedia resource; understanding the multimedia implications of the technology informs such aspects as pedagogy and resource design.

In the case of the learners, there appears to be less literature available focusing on their engagement with IWBs. The literature presents a picture of them welcoming the technology, being motivated by its use (Glover et al., 2005; Hall and Higgins, 2005; Smith et al., 2005) and often persuading their teachers to use it (Schuck and Kearney, 2007). As has been noted, the teacher is usually the main user of the IWB but there are examples of the IWB being used imaginatively to support learners with specific learning needs (Egerton, Cook and Stambolis, 2009; Carter, 2002).

Finally, perhaps the most significant outcome from this literature review is the recognition of a dearth of study relating to secondary English teaching. Whilst there are studies that have considered how IWBs are used in English teaching (for example,
Moss et al., 2007; Schuck and Kearney, 2007), it is rarely the sole focus of study. Consequently, such studies tend to explore generic issues. The absence of study focusing purely on English may be seen as surprising. English, as core secondary subject, carries particular significance within the curriculum and accounts for substantial curriculum time. The lack of serious study on this important curriculum area indicates a significant gap in the body of IWB research in general. This research study will shed important light on a hitherto underreported area.
3 RESEARCH DESIGN AND METHODOLOGY

3.1 Key questions
The review of the literature, conducted in the last chapter, establishes that as a curriculum area at secondary school, English has hitherto not been widely researched with regard to IWB use. The current paucity of research focusing principally on the use of IWBs in secondary English teaching and learning, has prompted the researcher to seek to establish a range of evidence illuminating the use of IWBs in an secondary English context. In particular, the researcher wished to design a study focusing on a number of key areas: typical patterns of usage of IWBs in English lessons; IWB content and its design; the purpose of IWB use in English and ascertaining information about the teacher context. The first of the key areas, typical usage, refers to acquiring evidence to answer questions on what might be considered fundamental areas of IWB use such as:

- when is the IWB used in English lessons?
- who uses the IWB in English lessons?
- who is the audience?

Such evidence should provide an important framework for describing how the IWBs are being used in English. The second area is aimed at establishing evidence relating to the content used on the IWB in English lessons. Data collection questions relating to this area include:

- what type of content is used on the IWB?
- how is the content composed?
- who created the content?

The third key area is related to the purposes behind IWB use, and seeks to ascertain what aspects of English are supported by IWB use, as well as more generic pedagogical purposes. Examples of data collection questions here are:

- at what stage in the teaching process are IWBs used?
- for what English skills are IWBs used?
- what type of English content is addressed?

The final key area is related to the teachers’ own contexts, and examples of questions here include:
• how long has the teacher worked with an IWB?
• what training has the teacher gained?
• what design decisions were taken by the teacher?

Reiterating the research question at this point demonstrates how these early questions have been assimilated into one principal question to guide the study.

*How, in terms of user, timing, content and purpose, are IWBs being utilised to teach English by a small number of secondary English teachers who are experienced in using the technology?*

However, the process of designing the research methodology has been an iterative one. The initial questions where shaped into an overall research question, but in the process of designing the research instrument for this study, the original – often more specific - questions were redrafted as ‘data collection questions’ (Punch, 2014, p.62) and were used to help design the data collections methods. This chapter aims to explicate how a methodology and research design emerged to answer the data collection questions, and thereby, the main research question.

### 3.2 Introduction to the methodology

This chapter starts with a consideration of the questions to emphasise that the methods used in a study ‘should follow from questions’ (Punch, 2014, p.7). Methods are ‘specific research techniques’ (Silverman, 2005, p.98) and methodology can be seen broadly as ‘a general approach to studying research topics’ (*ibid.*). More specifically, the methodology reveals ‘what was actually done, how it was done and why it was done in this way’ (Hennink, Hutter and Bailey, 2011, p.274). The methodology and the individual methods within this study have been chosen with the aim of extending knowledge and developing an enhanced understanding of how IWBs are being utilised within selected secondary English classrooms. They have been selected to answer the questions posed above.
A case study approach has been adopted, with the cases of seven English teachers being studied. In each case, three main methods have been used to gather data: systematic classroom observation; content analysis of the IWB screens during the lesson and semi-structured interviews with the teachers of the lessons. All three data collection methods used will be focused on the same case, with the aim of shining different searchlights on each case. The methods chosen draw on both quantitative and qualitative research traditions which combine to form a mixed methods approach. The reason for a mixed methods approach will be explored, and the selection and use of methods will be explained and described.

3.3 Case study: the rationale

A description of classroom practice is at the heart of this study, the intention being to apply three different data collection methods on each of seven teachers. Each teacher represents one case of English classroom practice using IWBs and by using multiple sources of data this study seeks to provide insight into the use of the IWB in selected lessons.

A case study approach has been chosen because it allows each case – or teacher – to be investigated by a range of methods or in order to produce a rich source of data. Denscombe (2007) identifies some of the characteristic qualities of case studies which allow for a detailed and in depth study (Table 3.1).

<table>
<thead>
<tr>
<th>Case study research characteristically emphasises</th>
<th></th>
<th>Case study research characteristically emphasises</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Depth of study</td>
<td>rather than</td>
<td>Breadth of study</td>
<td></td>
</tr>
<tr>
<td>The particular</td>
<td>rather than</td>
<td>The general</td>
<td></td>
</tr>
<tr>
<td>Relationships/processes</td>
<td>rather than</td>
<td>Outcomes and end-products</td>
<td></td>
</tr>
<tr>
<td>Holistic view</td>
<td>rather than</td>
<td>Isolated factors</td>
<td></td>
</tr>
<tr>
<td>Natural settings</td>
<td>rather than</td>
<td>Artificial situations</td>
<td></td>
</tr>
<tr>
<td>Multiple sources</td>
<td>rather than</td>
<td>One research method</td>
<td></td>
</tr>
</tbody>
</table>

Table 3.1: The qualities of case study research (Denscombe, 2007, p.37)
Tellis describes case studies as being ‘exploratory, explanatory and descriptive’ (1997, p.4). Denscombe further refines this, distinguishing between ‘discovery led’ and ‘theory led’ case studies (2007, p.38). The choice of case study in this project is to promote a ‘discovery led’ investigation where cases are described, explored and compared, as opposed to a ‘theory led’ study, intent on testing theory (ibid.).

The use of case studies to provide an in-depth scrutiny of a limited number of cases, in order to draw out particular features of practice rather than making general observations, is appropriate to this study. Its intrinsic aim is to provide a rich description of IWB use, one which goes beyond broad issues to provide a detailed picture of English classroom usage, focusing on particular factors relating to timing, user, purpose of use and content. It seeks to illuminate some of the processes and patterns of IWB use, such as when and where teachers choose to use the IWB in their lessons. The study focuses on working classrooms and, as far as possible when a researcher is present, reflects normal classroom practice. Consequently the cases will provide the ‘context-dependent knowledge’ (Flyvbjerg, 2007, p.390) necessary for learning about IWB use. A range of methods has been brought to bear on these few cases in order to reflect and investigate the complexity of using such resources in the classroom. The aim is to focus on the detail of the cases studies and, by doing so, to elucidate significant or noteworthy features and issues relating to IWB use in English lessons. Not only will this add to the body of research on IWB use in education, but it will provide empirical research within an area when little currently exists, i.e. on the use of IWBs to support the teaching of English content and skills.

Case studies may provide a detailed and precise description or reconstruction of a case (Flick, 2009). But how far can the findings of one case be generalisable? Hancke, whilst acknowledging that case studies have rich and complex uses, unequivocally advises that ‘Case studies are not made for generalizations… and intellectual honesty suggests that you simply avoid any reference to that possibility altogether’ (2009, p.61). Bassey (1999), on the other hand, considers the nuances of generalisations and distinguishes between the scientific generalisation, where irrefutable evidence is found, the statistical generalisation where extrapolations are made from a sample to a general population, and finally to what he terms fuzzy generalisations. These he
considers to be ‘qualified generalizations’ (Bassey, 1999 p.46), which offer possibility but not certainty. These fuzzy generalisations seem to be a recognition that case studies do not stand in isolation. Indeed, it is clear that a case study is inextricably linked to the body of which it is a part, like a single thread running through a piece of cloth. It may not be possible to generalise broadly about findings based upon one case (a pink thread does not mean the whole cloth is pink) but it may be that significant factors or issues might be identified, possibly for further study. Denscombe also identifies this point – that a case is ‘a single example of a broader class of things’ (2007, p.43) and goes on to point out that the extent of the generalisation is dependent on how close the case study is to other examples. He points out the need for the reader to be well informed about the nature of the case compared with others so that informed judgements can be made about the relevance of the case. The choice of cases, therefore, must be carefully considered and explained.

3.4 Case study: selection

The choice of cases within a case study is an important consideration. They should be selected with reference to the specific factors of the study to the study, and therefore should not be randomly chosen (Denscombe, 2007). Within this project, the key factors relate to practitioner experience, practitioner context and school context.

As a small-scale study, the aim is not to produce results which will be generalisable. Rather it is hoped that the data elicited will contribute to a richer picture of one area of practice, raising themes, questions and considerations for further investigation. In order to facilitate this, the study draws on data from more than one school. A minimum of three schools was decided upon as necessary to produce a range of data on IWB use. A further constraint on the research sample was accessibility. Consequently schools in the West Midlands area were chosen as being locations accessible to the researcher. The schools were approached as ones that came within the professional sphere of the researcher. Four schools contributed to the study. These were known by the pseudonyms Amberton School, Brightley School, Casland School and Doversford School. Having a variety of schools in terms of other issues such as size and contextual factors was thought to be desirable though not essential.
Securing the interest of experienced practitioners who were willing to take part in the study was an important factor. The pilot, conducted before the sample was chosen, had revealed that the presence of the researcher in the classroom, together with a camera recording screen content, required a co-operative and well-disposed teacher. Therefore, the researcher did not pursue contacts in schools where there was any hesitation or doubts emerging on the part of the teacher approached. The main criteria for choosing a case study teacher were:

- to be experienced in using an IWB
- to be using an IWB as a usual part of their day-to-day work in the English classroom.

In terms of length of experience, it was expected that the teachers would have worked with an IWB for at least eighteen months, as the focus of the study is on experienced users as opposed to new users of the technology. If possible, it was hoped to have users of over two years of experience as this is the length of time indicated by Somekh et al. (2007) as being necessary for proficient use of an IWB. The final list of teachers actually contains one teacher (Alice) who had newly qualified teacher (NQT) status, but who had completed a four-year undergraduate ITT course and so had gained some IWB experience over a number of years.

A key aspect of this study is to try to capture typical everyday use of IWB in the English classroom. Therefore, ‘Missioner’ teachers (Glover and Miller 2001a, p. 2), who enthusiastically promote technology, were not sought for this study, as they may present a picture of exceptional or unusual use. Where possible, the researcher sought to include more than one member of the department in the study. Again, the researcher wanted to avoid capturing exceptional use, but looking at more than one person from a department may also offer insight into whether the practices observed are individual to the teacher or department-influenced. The case study teachers were sought by the researcher using contacts from her professional sphere. A contact within each department was approached (usually the head of department) and asked to suggest colleagues who had everyday experience of using an IWB and had been using one for at least eighteen months. It was emphasised that ‘expert’ users or ‘Missioners’...
were not being sought, but rather colleagues who might be considered by the
department contact to be *everyday or routine* users of the technology. The use of
known contacts to suggest practitioners helped to ensure that the criteria were met,
and that the practitioners involved were reassured that being an accomplished or
*expert* user of technology was not a requirement for this study. The individual teachers
were then invited to become part of the study.

Such were the requirements for the sample. Once in the field, however, a number of
changes were deemed necessary. These mainly related to the staff willing to be
observed. It was anticipated that the case study teachers would come from three
schools. However, when only one colleague was willing participate from one of the
schools approached (Casland School), another school had to be approached
(Doversford School) where one teacher agreed to be contribute to the study. The final
study includes seven teachers from four schools (Table 3.2).

<table>
<thead>
<tr>
<th>School</th>
<th>Age range</th>
<th>Case study teachers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amberton</td>
<td>11-18</td>
<td>1) Abigail 2) Alice</td>
</tr>
<tr>
<td>Brightley</td>
<td>11-18</td>
<td>1) Beverley 2) Bill 3) Bryn</td>
</tr>
<tr>
<td>Casland</td>
<td>11-16</td>
<td>1) Cherry</td>
</tr>
<tr>
<td>Doversford</td>
<td>11-19</td>
<td>1) Deborah</td>
</tr>
</tbody>
</table>

Table 3.2: The schools and teachers in the study

The four schools engaged in this study are all located in the same region. With such a
limited number of schools, it is impossible to gain any real spread of schools, and this
is not necessary for a case study. However, there are identifiable differences and
similarities between them.

Amberton School is of average size – with around 900 pupils. It is situated in a
residential area on the outskirts of a city in the West Midlands and has a mainly White
British intake of pupils. Attainment on entry is below the national average. Brightley
School is above average size, located on the outskirts of a city in the West Midlands.
Pupils are mainly of White British background. There are more pupils with special
educational needs than the national average, and a very high proportion of pupils eligible for free school meals. Casland School is an average-sized school located in a metropolitan borough of the West Midlands. It is an over-subscribed school. Pupils are mostly White British, with one third being from minority ethnic backgrounds. Levels of pupils with learning difficulties, and those entitled to free school meals, are below the national average. Doversford is a very large school in a metropolitan borough of the West Midlands. The number of pupils eligible for free school meals is about average, whilst there is a below average proportion of pupils with special educational needs. The number of pupils from minority ethnic backgrounds is below average, with the majority of pupils being of White British heritage.

The schools vary considerably in terms of the catchment areas, although they are all in urban/suburban areas as opposed to rural areas. The context of the pupil intake in terms of prior attainment, special educational needs and eligibility for free school meals also varies, although the majority of pupils at all the schools are from White British backgrounds.

The case study teachers, therefore, work within a range of contexts (Table 3.3). Five of the seven are female. Five were also in their twenties at the time of the fieldwork. The most common ‘profile’ is that a female teacher under 30 years of age. Their readiness to include the technology of IWB within their teaching may be due to growing up in an age of technology, and therefore being termed by some as ‘digital natives’ (Prensky, 2001, p1). Alice, the youngest and least experienced teacher, was suggested for the study by her head of department who commented on her ease and facility with the technology, and her readiness to use IWBs in her lessons. Alice was halfway through her NQT year, but the others had at least three years’ classroom experience. Bryn was the longest serving teacher, having taught for eighteen years. He, together with Cherry, has the longest experience of working with IWBs (five years each). Three of the teachers - Cherry, Bill and Alice - have worked with IWBs for their whole teaching careers. Abigail and Beverley both have substantial experience as teachers (eight years each) but have only had eighteen months experience of working with an IWB. The seven case study teachers reflect a range of contexts and experiences, providing a
small but significant sample of teachers who make day-to-day use of the IWB in English teaching. The sample also enables a number of comparisons to be made, including comparisons both within and between school settings, comparisons of content and comparisons of approach.

<table>
<thead>
<tr>
<th>Teacher</th>
<th>School</th>
<th>Gender</th>
<th>Age</th>
<th>No. of years teaching</th>
<th>No. of years using IWB</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abigail</td>
<td>Amberton</td>
<td>F</td>
<td>29 yrs</td>
<td>8.0</td>
<td>1.5</td>
</tr>
<tr>
<td>Alice</td>
<td>Amberton</td>
<td>F</td>
<td>23 yrs</td>
<td>0.5</td>
<td>0.5</td>
</tr>
<tr>
<td>Beverley</td>
<td>Brightley</td>
<td>F</td>
<td>31 yrs</td>
<td>8.0</td>
<td>1.5</td>
</tr>
<tr>
<td>Bill</td>
<td>Brightley</td>
<td>M</td>
<td>24 yrs</td>
<td>3.0</td>
<td>3.0</td>
</tr>
<tr>
<td>Bryn</td>
<td>Brightley</td>
<td>M</td>
<td>45 yrs</td>
<td>18.0</td>
<td>5.0</td>
</tr>
<tr>
<td>Cherry</td>
<td>Casland</td>
<td>F</td>
<td>27 yrs</td>
<td>5.0</td>
<td>5.0</td>
</tr>
<tr>
<td>Deborah</td>
<td>Doversford</td>
<td>F</td>
<td>27 yrs</td>
<td>4.0</td>
<td>3.0</td>
</tr>
</tbody>
</table>

Table 3.3: Contextual details on the case study teachers

Lesson observations are one of the main methods of data collection in this study. The researcher asked to observe lessons which showed the teachers’ typical use of IWBs. The focus of the lesson was completely up to the teacher, with the only proviso that the lesson must involve IWB use at some stage. The choice of classes and lessons observed was up to the teacher, although naturally there had be negotiation about the times that would suit both teacher and researcher. In the case of Amberton School, the teachers observed specified particular classes to be observed, and the researcher returned to visit the school on a number of separate occasions in order to observe the classes. In the case of other schools, dates were set (e.g. one day for the visit) and the observations timetabled to suit the dates. This meant that a range of lessons from KS3 and KS4 were observed although the majority were Key Stage 3 lessons (Table 3.4).
<table>
<thead>
<tr>
<th>Teacher</th>
<th>Y7</th>
<th>Y8</th>
<th>Y9</th>
<th>Y10</th>
<th>Y11</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abigail</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Alice</td>
<td>2</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Beverley</td>
<td></td>
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<td>1</td>
<td></td>
</tr>
<tr>
<td>Bill</td>
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</tr>
<tr>
<td>Bryn</td>
<td></td>
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<td></td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Cherry</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Deborah</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Totals</td>
<td>6</td>
<td>3</td>
<td>2</td>
<td>3</td>
<td>2</td>
</tr>
</tbody>
</table>

**Key Stage 3 Total: 11**  
**Key Stage 4 Total: 5**

Table 3.4: The lessons observed in each year group

### 3.5 Mixed methods

The methods adopted in this case study draw upon both qualitative and quantitative research traditions, and so comprise a mixed methods approach. The dichotomy of mixed methods research has been summed up as a struggle between two broad views:

1) the Philosophical view in which qualitative and quantitative approaches are embedded in ‘divergent paradigms and separate spheres’ (Burgess, 2008 p.10)

2) the Mechanical approach characterises ‘convergent paradigms and right tools for the job’ (*ibid*) with methods existing on a spectrum: qualitative methods at one end and quantitative methods at the other. The decision to follow a mixed methods approach was motivated by what is perceived as the appropriateness of the methods - the ‘Mechanical’ approach – with the view that this presents the opportunity for a rigorous and detailed data collection. This study requires consideration of quantifiable data regarding use (for example, noting who is operating the IWB), as well as a more nuanced exploration of the classroom practice involving the use using IWBs (for example, exploring decisions relating to design of content). A mixed methods approach facilitates both types of exploration of the data.
Mixed methods is an evolving approach, and Tashakkori and Cresswell ruminate over the definition of mixed methods in their inaugural editorial of the *Journal of Mixed Methods Research*, pointing out that a mixed methods project is generally regarded as ‘one that includes a qualitative and a quantitative substudy’ although ‘Inconsistencies and disagreements start when one considers how the two substudies (or strands) are related to each other.’ (2007, p.3). They settle on a definition of mixed methods as ‘research in which the investigator collects and analyzes data, integrates the findings, and draws inferences using both qualitative and quantitative approaches or methods in a single study or a program of inquiry’ (2007, p.4). The relationship between substudies and the integration of findings is a key consideration. Teddlie and Tashakkori distinguish between mixed methods studies, where the findings are integrated, and studies where the data is collected but not integrated which they term ‘quasi-mixed designs’ (2006, p.15). Flick’s guidance on combining qualitative and quantitative research, implies that both approaches should be given ‘equal weight’ (2009, p.33). Within this study, the interrelatedness and relative importance of each of the methods will hopefully be made clear, as the intention and expectation is that the methods will work together ‘in such a way that the quantitative and qualitative components are mutually illuminating’ (Bryman, 2007 p8).

### 3.6 Triangulation

This study focuses upon seven case study teachers. Three methods have been chosen to explore the practice in each case: classroom observation, content analysis of IWB content and interviews with the teachers. These methods each work separately to provide distinct areas of data on the case study teacher. However, they also work concomitantly to explore the same source of data, that is, the observed lessons from the case study teachers. So, for example, aspects of the IWB content are 1) observed in practice during the lesson 2) analysed as part of the content analysis and 3) discussed with the teacher during the interview. The methods will stimulate data collection in their own right, thereby providing separate bodies of data but, because they are focused on the same event, they will also provide data that is connected and which can be checked against each other. Thus the combination of different methods
will allow for triangulation of the data within each case study. However, they also allow for triangulation across the case studies, allowing, for example, seeming anomalies in one case to be checked for in other cases.

Hammersley (2008) asserts that researchers’ interpretations of the term triangulation are not always clear. Of the four meanings for triangulation he identifies, two are particularly pertinent to this study. The first of these is seeing triangulation as checking validity: ‘by drawing data from sources that have very different potential threats to validity it is possible to reduce the chances of reaching false conclusions’ (Hammersley, 2008, p. 23). In this project, for example, the semi-structured interview will enable checks to be made on the purpose of aspects noted in the classroom observation. A further meaning identified by Hammersley is ‘triangulation as seeking complementary information’ (2008, p. 27). Different methods offer different perspectives. They might not validate each other, but they provide different and complementary information about the event/phenomenon, which will help to build a fuller picture.

The range of methods proposed here, then, is intended to contribute to a more enhanced description of the place of IWBs in English classrooms. The next part of this chapter will describe and explain the chosen methods in this study.

3.7 Systematic classroom observation

3.7.1 An introduction to the method
In a study which is focused upon classroom practice, it is perhaps unsurprising to find observation as one of the data collection methods. Observation ‘enables the researchers to systematically observe and record people’s behaviour, actions and interactions’ (Hennink, Hutter and Bailey, 2011, p.170) and recordings to take place within the natural or usual environment. Belying the seeming simplicity of the method, observation is a complex activity involving multiple tasks, including ‘systematically watching, listening, questioning and recording people’s behaviours, expressions and interactions as well as noting the social setting, location or context in which the people are situated’ (Hennink, Hutter and Bailey, 2011, p.170).
Hennink, Hutter and Bailey (2011) emphasise that observation as a method is a systematic, carefully planned process. Within this study, the particular method of observation used is systematic classroom observation (SCO). Here the use of the term systematic is not a general descriptor, but is a specific indicator of the method. Croll explains that this is a method where observers ‘devise a systematic set of rules for recording and classifying classroom events’ (1986, p.1). The essential characteristics have been noted as the observer recording the events systematically, as they happen, using a coding system which allows for subsequent analysis of events (Galton, 1979). The coding system is designed to reduce the subjectivity of the observer, so that any observer would code the events in the same way, allowing for ‘limited objectivity’ (Croll, 1986, p.6) where the results can be expressed precisely and it can be clearly understood how the data was produced. SCO is considered a quantitative method as the findings are usually recorded in quantitative terms and it attempts to ‘remove part of the subjectivity which occurs when individuals describe events’ (Croll, 1986, p.4). Collections of such systems have been collated and published. American researchers Simon and Boyer published a number of surveys of observation systems including Mirrors for Behavior III (1974) which contained outlines of ninety-nine such systems. A British anthology was also compiled - British Mirrors (Galton, 1978) – listing forty systems. These collections appeared to be part of an attempt to ‘legitimise’ systematic research: ‘People have been observing each other since time began but it is only recently that ‘people watching’ has become a technical skill struggling to become a science’ (Simon and Boyer, 1974, p.33).

There are different approaches to SCO. The two main systems noted by Wragg (1999) are the category system and the sign system. They both note events within a timeframe, but the category system notes every occurrence, whilst the sign system records an event only once within a given time segment. There are advantages and disadvantages to both systems. The category system records each event, but is demanding on the observer. The sign system does not provide the detail in terms of the number of times an event occurs, but it does provide a profile which should reflect the nature of the observed lesson. Within this study, systematic observation is used to
gather data on a number of distinct areas and on different categories within each area. Consequently a sign system was used in this study, as this was seen as the most feasible and workable option when dealing with multiple variables.

3.7.2 The design of the SCO in this study

In the early stages of design, careful thought was given to such questions as:

- What kinds of data might be elicited by the different methods?
- How much data might realistically be gathered?
- How can internal checks and triangulation be facilitated whilst avoiding unnecessary overlap between the methods?

First of all the key information was considered, i.e. the information that could only be gathered by the researcher observing the lesson, as opposed to the other methods being used. The key areas for consideration emerged as:

- the timing of IWB use
- the user of the IWB
- the audience for the IWB.

Gathering data on these areas would hopefully offer insight into questions such as:

- Are IWBs on throughout a lesson?
- Are they used throughout a lesson?
- How often do pupils operate a IWB?
- Is the audience always the whole class?

Another level of enquiry focused on data it would be easier to ascertain through observation rather than content analysis:

- the origin of the text
- the type of content used on the board
- the function the board is serving for the teacher.

Data on these areas might help to answer questions such as:

- Do teachers tend to use their own materials?
- Are IWBs used much for showing images?
- Is the main function of the IWB to display material?
Finally, there were also areas that were considered of interest, but not essential to answering the main research question. Such areas included:

- What other media, if any, is used in conjunction with the board? (i.e. used concurrently)
- What is the cognitive level of the material?

Through consideration of these areas and questions, a framework of eight variables was created, and then different categories of response were generated for each variable. For example, one of the variables focused upon the ‘broad function of the IWB’. The aim of this variable is to ascertain how the teachers use the IWB for particular functions, for example, using the IWB for displaying material. This variable was given the following categories:

1. display/broadcasting
2. writing/annotation (using finger or pen)
3. manipulation of materials (using finger or pen or mouse)
4. resource management (e.g. saving files).

Each of the variables, and the categories of response within it, was devised using the researcher’s considerable experience and previous reading on how IWBs are used. The variables and categories were coded and put on to a data collection sheet (Appendix A). Knowing that the SCO would be conducted under a tight time-schedule, it was important that the coding was clear and unambiguous. As well as having space to record the individual observations, each variable and its categories are listed on the sheet for easy reference. There is also a limited space for the researcher to note ‘other’ categories or make general notes. As this is a sign system, it does not record every incidence, but records the data at regular, timed intervals. The coding must allow for all possibilities and be straightforward to carry out. Most of the variables require a quick observation to be made and recorded on the data collection sheet. The data collection sheet also enabled the collection of data on seven other areas to help identify the lesson and its context (e.g. teacher and school).

The SCO method and form were piloted in a school unconnected with the schools in the main study. The main purposes of the pilot were to ensure that:
• the data could be collected in the planned timeframe
• the technology for timing each observation worked
• the data collection form could collate the data as intended.

The impact of the observer in the classroom was also assessed and any other unanticipated effects were sought. Following the pilot, it was decided that each of the eight variables could be comfortably recorded in one-minute intervals. So a sixty-minute lesson, for example, would have a maximum of sixty records for each variables. The ‘cognitive level of the material’ variable was the least straightforward as it required a judgement to be made on the content indicating, for example, whether the material required comprehension or analysis skills. In cases where more than one cognitive level was demanded, the researcher opted for the main or overriding one. This variable was deliberately left until last on the data collection form, to avoid the judgement or thinking time required by the researcher from impeding the other variables. The potential danger of this approach is rushing a decision on this variable. In practice, the observer tended to have a longer time to consider this variable, as the noting of the other variables was a swift process.

3.7.3 The operation of SCO in this study
The researcher was the observer in each of the observed lessons. The timing of the observations was regulated by a timer set up on a small laptop, which emitted a beep that could be heard through an earpiece. Each time the beep was emitted, the observer recorded observations against all of the variables on the data collection sheet. Recording the observations should have taken place for every minute of the lesson. In practice, the recording of data only started when the first pupil arrived, and sometimes this would be late - in the case of school assembly overrunning, for example. The observation would continue until the end of the lesson, or the end of the taught period, although two of the observed lessons had private reading sessions for the last twenty minutes of the lesson, and the observations stopped as these began.

As these observations were taking place in lessons, consideration had to be given to the possible effects of this: ‘the very presence of an additional adult who is not
normally present may itself influence what happens’ (Wragg, 1999, p.15). The students were aware of the research as they had signed consent forms, but prior to the lesson, or at the start of the lesson, the teacher explained the presence of the observer, the process being used by the observer and why it was important not to talk to the observer. In most cases, the observer was seated at the back of the classroom, so as to stay out of the line of sight of most pupils.

In practice, the SCO was an uncomplicated method of data collection. The initial glances and interest from pupils noticing a stranger in the classroom, soon faded into mostly ignoring the observer. As eight variables need a little time to be recorded, a decision was taken at the start to record these in order one after the other. This means that the variables do not absolutely refer to the same moment in time as it is too difficult to remember everything at the moment that the timer sounds. But the recording of each variable is within a few seconds of each other and each variable was recorded in the same order each time, to maintain consistency. Careful planning meant that most potential issues with the variables and their categories were forestalled. One ambiguity that did arise, however, related to the ‘On/Off’ variable which recorded up to seven categories relating to its status (Appendix A). Category 4 (‘IWB on, in background’) was problematic in some circumstances. Recording ‘4’ and leaving most of the remaining categories blank was intended to mean the IWB was on in the background and essentially being ignored. However, occasionally it was left on in the background but with useful information for students to refer back to. In such cases the decision was made to record ‘4’ but also to record the remaining data to indicate that some pupils were actually using the IWB. This enabled the researcher to record this as an additional category for this variable in the final analysis.

The data gathered through this systematic classroom observation, will not provide detailed information about exactly how long the IWB was in use for, nor will it be able to say exactly how many users there are of the IWB on one lesson. This is because a series of one-minute snapshots have been taken, rather than a continuous recording of data. Consequently a complete picture is not provided. However, it is sufficiently robust to provide a detailed profile of use within a lesson and about the patterns and
processes at work within each lesson. For example, even though the method used did not allow for continuous data collection on when the IWB was being used, the recordings taken every minute do provide a clear indicator of when the IWB is being used (or not used) for periods of time in the observed lesson.

3.7.4 Planning the analysis of the SCO data

The analysis of the data in this study was guided by the mixed methods approach to this research. Punch (2014) distinguishes between the characteristics of quantitative and qualitative methods. Quantitative approaches conceptualise reality ‘in terms of variables’ and their relationships, and analysis rests on the measurement of the data rather than context (Punch, 2014, p.307). Qualitative methods, on the other hand, use ‘cases’ which are ‘sensitive to context and process’ (ibid.). The methods used within this study recognise this distinction, and the analysis of both variables and cases is intended to draw on the flexibility of approach that using mixed methods allows.

The record sheet for collecting the data (Appendix A) indicates the areas of data collection. The variables for the analysis of the SCOs were established a priori, allowing the analysis of the data over three main areas:
1) when the IWB is used in a lesson
2) the user(s) of the IWB
3) the general function performed by the IWB.

Sixteen lessons were observed. These variables, and their associated values, provide the structure for the analysis of the data within this method. The use of a standard data analysis program (SPSS) supported the handling and analysis of the data collected.

3.8 Content analysis

3.8.1 An introduction to the method

In order to gain insight into the contribution of IWBs to the pedagogy of the English classroom, it is necessary to develop an understanding of the content used on IWBs.
and the purpose that this content serves. The content is primarily visual and there are, of course, different approaches associated with studying visual data. For example, a semiotic approach might be taken, entailing ‘the detailed examination of a small number of ‘texts’ with the aim of uncovering or decoding their hidden cultural codes and messages’ (Emmison, 2011, p.234). With semiotics, the primary issue is one of interpretation, and giving an image 'its place in a system of cultural representation' (Emmison and Smith, 2000, p.46). A semiotic analysis of IWB content would make a fascinating and worthwhile study but the researcher considers that a broader and possibly more fundamental understanding of the content is first required. Hence, content analysis (CA) has been chosen as a means to allow for an objective way of quantifying and describing the content of the IWBs.

CA has been defined as ‘an empirical (observational) and objective procedure for quantifying recorded ‘audio-visual’ (including verbal) representation using reliable, explicitly defined categories’ (Bell, 2004, p.13). Unlike semiotic methods, for example, it does not seek to analyse individual texts, but rather ‘allows quantification of samples of observable content classified into distinct categories’ (Bell, 2004, p.14). It permits a researcher to discuss visual content through describing the constituent parts of a text.

### 3.8.2 The design of the CA in this study

Bell points out that ‘a content analysis begins with the definition of relevant variables and of the values on each’ (2004, p.16) and so a number of categories or variables were created to address two main areas:

1. the nature of the content used on the IWBs within the observed lessons
2. the pedagogical purposes of the content used on the IWBs.

In other words, this method was designed to reveal more about what was on the IWBs and why it was there.
**The nature of the content**

In regard to the first of the areas to be analysed using CA, the initial consideration was to consider what data to gather. An initial ‘brainstorming’ of ideas led to a range of questions being posed by the researcher, such as:

- Do the teachers favour particular any application/program/resource in their teaching?
- Which do the teachers use more – published materials or their own created resources?
- Do the teachers re-use or review resources within the same lesson?
- Is any of the content pupil-prepared?
- When creating written text, do the teachers most often present text as handwritten or printed?
- Do the teachers frequently include images within their resources?
- Is colour often used (in text, background, images)?
- Are audio or sound elements often used as resources on the IWB?

These questions reflect the variety of areas for possible analysis and they also emphasise the wide range of choices relating to content being made by teachers using IWBs.

A data collection sheet was designed (Appendix B) incorporating six variables. Three of these variables were concerned with the nature of the content:

1. The type of resource
2. The creator of the resource
3. The main compositional elements of the resource.

Following the method of CA of visual images described by Bell (2004) where visual content is classified into quantifiable categories or variables, variables were created for the content. Each variable consisted of ‘values’ that ‘should be mutually exclusive and exhaustive’ (Bell, 2004, p.5). In other words, the values covered all response possibilities.

The first variable – the type of resource – comprised of a list of nineteen values including PowerPoint, games and Internet pages. There was also capacity to indicate
whether the resource was repeatedly shown, or was modified during the lesson, to give an indication of whether teachers revisited and/or manipulated the resources.

The second variable relating to the nature of the content, sought to establish the originator of the resource. Interest in this area was stimulated by a study on the use of IWB in the core subjects at secondary level, which had noted that most of the texts used were teacher-made yet ‘many teachers struggle to incorporate principles of design which can establish clear reading paths for pupils’ (Moss et al., 2007, p.5). The requirement to design and create texts for IWB use, is seemingly an additional demand and, possibly, pressure on teachers and the researcher was interested to see how this is reflected in their choices in practice. The values for this variable were designed to show whether the resources were:

- externally prepared
- teacher prepared
- student prepared.

The final variable relating to the nature of the content, focused on the constituent make-up of the resources. The variable was labelled ‘main composition elements’ and comprised of values indicating the constituent parts of the content, for example ‘printed text’, ‘handwritten text’ and ‘still image’.

**The pedagogical purposes of the content**

The other focus for the content analysis is to consider the pedagogical purpose of the IWB content. The researcher wants to try to establish when and where in the teaching sequence that teachers focus their inclusion of IWB use. For example, do the teachers in the study tend to use them for a particular stage of the teaching, such as gaining initial attention or summarising the learning? Furthermore, in a study with a particular and deliberate focus on IWB use in the English classroom, it is also important to consider what aspects of English teaching and learning are being supported by IWB use. For example, are IWBs used throughout the English curriculum or do teachers direct their use towards particular themes or areas of study, such as writing, poetry or media study?
As with the analysis of the nature of the content, a clear classification of the variables was needed to enable an unambiguous analysis of the data. The complexity of the nature of both pedagogy and English teaching meant that considering what to look at and in how much depth was a demanding and time-consuming task. For example, if a teacher shows a video of Romeo and Juliet on the IWB, the pedagogical and/or English focus might include any (and any combination) of the following aspects:

- engaging the pupils in a play
- making a pre-1900 text accessible
- understanding of plot
- learning about historical context
- understanding the media of film works
- insight into a director’s interpretation
- preparing to write a review.

Trying to capture this focus in a meaningful way is challenging and complex.

After various frameworks for collecting the data were considered, three variables were decided upon:

1. Stage of instruction
2. English skills
3. English study areas

The ‘stage of instruction’ variable is designed to provide a broad indication of at what part in the learning the IWB is being used. It is based upon the nine instructional events devised by Gagne (1985) as part of his Conditions of Learning theory (Table 3.5).

Gagne saw these as providing the basis for instruction design. He saw instruction as referring to the ‘arranging the conditions of learning that are external to the learner... [that] need to be constructed in a stage-‘by-stage fashion’ (1985, p.20). Gagne’s instructional events provide a clear, manageable structure for analysing the resources in terms of how they address the different stages in teaching and learning. Echoes of these stages can be seen within Secondary Strategy materials and approaches on structuring lessons (DfES, 2004). With some slight modification, to bring these stages
closer to the Secondary Strategy approaches that are now familiar in schools, these stages have been used as the values of the ‘Stage of instruction’ variable.

<table>
<thead>
<tr>
<th>Gagne’s instructional events</th>
<th>Stages used in this study</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. gaining attention (reception)</td>
<td>1. Gaining attention</td>
</tr>
<tr>
<td>2. informing learners of the objective (expectancy)</td>
<td>2. Identifying objectives</td>
</tr>
<tr>
<td>3. stimulating recall of prior learning (retrieval)</td>
<td>3. Recalling prior learning</td>
</tr>
<tr>
<td>4. presenting the stimulus (selective perception)</td>
<td>4. Presenting stimulus</td>
</tr>
<tr>
<td>5. providing learning guidance (semantic encoding)</td>
<td>5. Guiding learning</td>
</tr>
<tr>
<td>6. eliciting performance (responding)</td>
<td>6. Eliciting performance</td>
</tr>
<tr>
<td>7. providing feedback (reinforcement)</td>
<td>7. Reviewing/plenary</td>
</tr>
<tr>
<td>9. enhancing retention and transfer (generalization)</td>
<td></td>
</tr>
</tbody>
</table>

Table 3.5: Gagne’s instructional events and the stages used in this study
The final two variables deal with ‘English skills’ and ‘English study areas’. These variables are intended to indicate which areas of the typical work done in English are the focus of the IWB content. For ‘English skills’ a manageable system was needed for categorising a complex area, and The National Curriculum (QCA, 2007) and The Framework for Secondary English (FSE) (QCA, 2008) have been used as the basis for providing the values for this variable:

- Speaking and Listening
- Reading
- Writing
- Language

Each of these four areas are further defined within the FSE. For example, reading is broken down into a) reading for meaning and b) understanding the author’s craft. The CA data collection sheet, allows the researcher to record both the main strand (e.g. reading) and the substrand (e.g. reading for meaning).

However, when this approach was piloted, the researcher did not feel that it allowed sufficient detail about the English content, and added an additional variable, known as ‘English study areas’. This variable referred to typical of areas which are the means or vehicle by which English teachers typically deliver the skills, knowledge and understanding demanded by the NC and the FSE. These areas were chosen as ones that concur with the researcher’s own experience of English teaching (including working with a wide range of English departments), and they generally typify the classifications of subject content in much of the literature on teaching English (for example, Clarke, Dickenson and Westbrook (2010); Davison and Dowson (2009); Dymoke (2009)). These study areas are often directly centred on the study of texts (for example, a class reader; a genre; an anthology) but not always (for example, study devoted to writing autobiography). Department schemes of work often use such study areas as the means of organising or systematising different types of study within the subject. For example, a department may have a year plan for one year group which is organised under these study areas: novel, poetry, drama, media, non-fiction, extended writing. The study areas chosen for this study are considered to
characterise typical study areas although they are not exhaustive or exclusive. Rather they provide an indication of possible English study areas. The areas are:

- Novel/lit prose
- Poetry
- Play
- Non-fiction
- Media
- Pupil response
- Other.

‘Pupil response' was a late addition to the process, and was added in response to the data gathered, which indicated that much of the focus was on pupils’ own ideas. It is designed to capture responses that emanate from the pupils, as opposed to from the texts studied. By considering where teachers are using IWBs within these study areas should provide insight into the affordances of IWBs.

By attending to these values, which typically underlie many schemes of work in English, further detail can be elicited through this method, whilst keeping the process and paperwork for collating the data manageable.

3.8.3 The operation of CA in this study

Considerable time was given to considering how to capture the content for this data collection. Three main possible approaches emerged:

- videoing the IWB during the lesson
- using software to capture the board content
- using a small video camera to record the content from the PC monitor attached to the IWB.

Each approach had strengths and weaknesses. Videoing the IWB during the course of the lesson allows a number of benefits. First, it provides a real-time record of the use of the IWB so that an observer can observe and revisit exactly how the board is being used, in the same timeframe as it was used during the observed lesson. Furthermore,
it has the advantage of providing a representation close to what students in the class see. It may also enable the viewer to see who is using the IWB and how. It enables the recording sound so that the dialogue in the classroom can be captured. There are a number of disadvantages, however, including the intrusive effect of videoing in a classroom, the need for widespread permissions for videoing and the difficulty the camera may have in picking up the detail of what is broadcast on the board.

Another method is to use special software. Both of the main brands of IWB – Smartboard and Promethean – have screen capture software available. Smartboard records the content of the IWB in real-time, whereas Promethean condenses the content, so that it is possible to see the sequence of screens that has been broadcast but not the timing that was given to each screen of content. Not being able to capture the timing of the IWB would be distinct disadvantage in this study, as it would preclude a triangulation opportunity of comparing the SCO data with the recorded data.

The final possibility, which was the approach actually used, involved the use of a small ‘Flip’ camera. As each IWB is linked to a controlling computer with a monitor, the camera can be placed in front of the monitor to record the content. This has the advantage of being unobtrusive. It can record in real time (and so allow comparison of the data with the SCO data) and there would be no filming of people/pupils (which would require special permissions). A slight disadvantage is that teachers occasionally ‘freeze’ the IWB screen, whilst working on their PC to set up the next resource. This did happen on occasion, but it was possible to account for this in the analysis through comparison with the SCO data. Slightly more problematic was its location. Being sited on the teacher’s desk, as it was most of the time, meant that it was liable to be knocked by anyone close by. This did happen at certain times, but it did not affect the researcher’s ability to analyse the data. The major problem with this arrangement was that once it was set up, it was on its own, and the researcher could not check on it. This was a problem on two occasions: once when the camera failed to record any of the lesson, and on a second occasion when it stopped recording part way through the lesson. The data, therefore, was incomplete or not available for these two lessons and
consequently the CA method was used with only fourteen of the sixteen lessons observed by SCO.

### 3.8.4 Planning the analysis of the CA

The analysis of the IWB content was made through the use of six variables focusing on the type of resource, the originator, aspects of composition and the pedagogical intent of the resource. Whilst coding against some variables was a simple recording task, others required a ‘high inference approach’ (Wragg, 1999, p.24) with greater levels of subjective judgement on the part of the researcher.

A record sheet was designed to support analysis of the data from each videoed lesson (Appendix B). This proforma was accompanied by a guidance sheet (Appendix C) which provided guidance on completing the proforma in order to maintain a consistent and replicable approach to recording the data. The record sheet lists the variables and the values for each variable. In designing the record sheet, the researcher sought to be comprehensive and exhaustive, so listing all possibilities. A record was made for each text shown on the IWB. A data file was set up, using the data analysis software, SPSS, to help to check and then to explore the recorded data.

### 3.9 Teacher interviews

#### 3.9.1 An introduction to the method

A rich source of data about the use of IWB use is, of course, the teachers themselves. It was decided that an in-depth interview would be an effective method of drawing out data from this source. Hennick *et al.* point out that in-depth interviews ‘seek to capture people’s individual voices and stories’ (2011, p.110). In other words, they provide a particular and personalised account of the context and issues relating to the study. The interviews were intended to find out each teacher’s ‘side of the story’, as opposed to the researcher relying only on assumptions and interpretations of what the teacher’s intentions, choices and experiences might be. The interviews aimed to gain a better insight into the decisions made on using IWBs in the observed lesson and
thereby to provide greater insight into how and where the teachers perceive IWBs as contributing to English teaching and learning. Punch emphasises the power of the interview for understanding others and considers that whilst there are different typologies of interviews, the main variations are ‘the degree of structure in the interview, and how deep the interview tries to go’ (2005, p.170). This project adopts a semi-structured format, where the general areas for questions are predetermined, but there is room for flexibility in the direction of the questions and in the nature of the response.

3.9.2 The design of the interview method in this study

An in-depth interview might deal with many areas, such as past experiences with the technology, feelings about IWBs, how to use a IWB for particular effects, and so on. The first design consideration, therefore, was to delimit the areas for consideration and questioning and to address the exploration of key areas. The main research question, set out again here as a reminder, was used as a guiding steer:

*How, in terms of user, timing, content and purpose, are IWBs being utilised to teach English by a small number of secondary English teachers who are experienced in using the technology?*

It was decided that the design of the interview instrument would focus on three main areas:

- the teachers’ levels of experience
- patterns of use
- illuminating the decision-making processes behind the observed lessons.

A limited set of interview questions (Appendix D) was devised to act as a prompt or ‘interview guide’ (Hennink, Hutter and Bailey, 2011, p.112) but not to act as a questionnaire. Instead this guide was to help the teachers ‘participate in an interview and tell their own story’ (ibid.). The questions/prompts were designed to provide a structure to this ‘story’ but to allow the teachers to reveal the areas that were of importance to them.
The level of experience of the teachers involved has been an important factor within this study and the interview sought to examine the nature of this experience in terms of time spent with IWBs, types of IWBs used and training undertaken. Questions about the features of IWBs used and utilising IWBs for particular purposes sought to prompt discussion on patterns of use. However, the main emphasis of the interview was exploring the decisions made in using the resources observed in the case study lessons. Three or four screenprints of IWB key screens observed during the lesson(s) were brought to the interview for consideration. These key screens were chosen by the researcher as ones which appeared significant in some manner, typifying, for example, a technique used or because of the use of a particular resource or effect. They were considered key screens, in the same way as a critical or key incident might be used to develop understanding of an issue: ‘Key incidents suggest and direct analysis in ways that ultimately help to open up significant... lines of conceptual development’ (Emerson, 2004, p.427). The key screens were also used as a prompt to discuss the wider aspects of IWB use, such as whether the techniques were the teacher’s own or were part of the wider resources of the department. The semi-structured approach provided the opportunity for discussion on specific areas but also permitted variety and depth in the answers, including responses not anticipated.

3.9.3 The operation of the interviews in this study
Mason identifies four core features of in-depth interviewing: an ‘interactional exchange of dialogue’; a ‘relatively informal style’; that they are ‘thematic, topic-centred’ and that the ‘knowledge is situated and contextual’ (2002, p.62). These were all important elements in the design and operation of this interview instrument. The interviews took place in the teachers’ schools, and in order for an effective dialogue to arise, the researcher requested that they would be held in an office/quiet room where the teacher would be uninterrupted. Overall, there was a clear formality to the interviews, in that they were carefully timetabled, they followed a format and they were recorded, but the researcher attempted to soften the hard corners of this formality by couching it within rather informal chat at the start of the interview in particular, with the aim of putting the teachers at ease. This is an important process,
because, as Oppenheim points out, ‘An interview is not an ordinary conversation, although the exploratory interview appears similar in some respects’ (1992, p65). He goes on to remind us that ‘an interview is essentially a one-way process’ (Oppenheim, 1992, p66). It is important that the interviewer recognises this degree of unbalance and works hard in other ways (for example, in introductory comments and in use of body language) to contribute to her side of the dialogue.

In this study, the researcher also gave interviewees an idea of the expectations beforehand by outlining what the structure and the topic of the interview would be. The researcher attempted to put the teachers at ease by making it clear that their experience and expertise within their own context was valuable data, and that this was what was being sought from the interview.

The teachers were also advised that printouts of key screens would be the main focus for discussion. These acted as a valuable reminder of the content of the lesson(s) as well as a prompt for ideas to add to the discussion. Overall, the use of the key screen was a helpful device within the interview. The teachers seemed very happy to explain the content of the key screens, explanations which sometimes stayed with the individual screens and sometimes led off to other aspects of related practice.

The position of the researcher/interviewer within the dialogue can be difficult to manage. Oppenheim advises that the in-depth interviewer ‘must ‘switch off’ their own personality and attitudes... and try to be unaffected by circumstances, by their attitude to the topic or the respondent, or by personal involvement’ (1992, p.66). This may be good advice, but it may also be unrealistic in some senses. Removing ‘personality’ is a very difficult requirement – and perhaps not one that is totally possible. It may be that the interviewer takes on a particular role (e.g. facilitator, questioner, reassurer) but it is likely that the interviewer’s personality will be evident in the management of the role. Nevertheless, Oppenheim is surely right in wanting the interviewer to do his/her best to reduce their influence in the data gathered. In the case of these interviews, the interviewer asked open questions (e.g. ‘can you talk me through why …?’) to allow the respondent to expand on areas of importance to
him/her. Furthermore, the interviewer did not proffer information about her own experience with the topic, but used this knowledge when appropriate, e.g. to ask an interviewee further questions about a particular area.

The timing of the interviews was an important consideration. There needed to be an interval between the observed lesson and the interview, long enough for the researcher to review the IWB content and take a decision upon the key screens, but not so long that the teacher would forget the planning of the lesson. In practice, the interviews took place about one week after the last lesson observation. The length of the interview was also an important consideration. As they were taking place within a busy school day, and they were usually undertaken during the teacher’s own planning and preparation time, keeping the timing to a reasonable length was important and so the interviews were around twenty minutes long. The interviews were recorded with an audio recorder. This was deliberately chosen as a small, unobtrusive device (about 8cmsx3cms) that lay on the table between the teacher and the researcher. The recordings were transcribed to support analysis of the data.

3.9.4 Planning the analysis of the data from the interviews

After transcription, the teacher interviews were saved in digital form. They were imported into analysis software for qualitative data (NVivo) for an initial consideration of the data and its underlying themes. This study involves a thematic analysis of the data, with a framework analysis of the themes and cases. The themes arise mainly from the direction given by the choice of questions within the interview. For example, the case study teachers were asked specifically about the design choices they made with the resources shown on the IWB, and consequently content design is a theme within the analysis of the data. However, the sub-themes which help to structure the analysis emanate from data within the interviews. It is the categorisation of data from the interviews that led to the sub-themes.

Framework Analysis supports the exploration of the data. This process, developed by Ritchie and Spencer at the National Centre for Social Research (NatCen), is a data
management tool as opposed to a means of interpreting data (Barnard, 2010). The framework helps to manage the process, primarily by allowing the breaking down and reassembling of data, but can also assist with prioritisation and navigation of the data (Barnard 2010). In this study, the framework consists of a matrix focused on one theme. (Further detail about the themes chosen can be found at Chapter 6.2.) Each row represents one case, or teacher, and the columns represent the sub-themes. Each sub-theme is therefore set against each teacher. In this way, the relevant data on each theme is given for each case study teacher. (Table 3.6 is an example of blank matrix. A completed example can be found at Appendix E.) A summary of the data is put into the cells of the matrix, as opposed to the verbatim text, which not only keeps the matrix manageable but also supports the process of moving away from the verbatim text, towards a conceptualisation of the data (Barnard 2010). Each entry is given a number reference back to the original interview. A major advantage of organising the data in this way is that it facilitates a focus on both the case study and the theme. It enables the researcher to investigate a theme (i.e. the content of the columns) and it also enables the exploration of one case across a number of themes. It helps to ensure that the theme is viewed across all the possible cases and it helps to maintain the association between the themes and the cases.

<table>
<thead>
<tr>
<th>Case</th>
<th>Lesson management</th>
<th>Whole class focus - teacher directed</th>
<th>Whole class focus - student interactivity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abigail</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Alice</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Beverley</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bill</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bryn</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cherry</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Deborah</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 3.6: A blank matrix (on the impact of the IWB)
3.10 Quality and ethics

Confidence in the results of this study will only be achieved if it is established that the study is fair, reliable, valid and ethical as far as it possibly can be. It is important, therefore, to establish credibility in the design, qualities and processes of the data collection and analysis.

3.10.1 Reflexivity

‘Social researchers are part of the social world they study’ (Punch, 2005, p. 165) and it is important to acknowledge that this study of IWBs emanates from the researcher’s own experiences and interest in the field. As a practitioner, the researcher has had considerable experience of working with IWBs, including providing training nationally, and therefore recognises the danger of this exerting an undue influence on the research project. Such bias may arise at any point within the project, such as the choice of schools, the design of the interview framework or the analysis of the data.

The fieldwork took place in schools where the researcher was known in a professional capacity but not known for her interest in IWB and educational technology. Whilst having an obvious interest in the area of ICT and IWB use, the researcher wanted to avoid portraying herself as an ‘expert’ in the field when working with the case study teachers. This was considered important, as the researcher wished the case study teachers to contribute their thoughts, ideas and experiences with as much openness and confidence as possible and not to feel inhibited by whom they are talking to. Therefore the researcher did not specifically talk about her own experiences with IWBs but kept any references general or unspecific. This approach was necessary particularly in personal dealings with the teacher participants (for example, the initial meeting and the interview) as well as with the other people consulted (the headteacher, for example). However, qualitative research methods ‘take the researcher’s communication with the field and its members as an explicit part of knowledge’ (Flick 2009, p.16) and during the interview, it was important that respondents felt they were talking to an interested and informed observer, so that the level of discussion did not reduce to too basic a level. Equally, the researcher did not
wish the case study teachers to respond in ways designed to please the researcher or to provide what might be considered ‘correct’ answers. By careful use of open questions and through the dialogue, the researcher acted as an interested observer and tried to avoid making assumptions, but treated the teacher as the ‘expert’ so that s/he could share her/his side of the story. Reflexivity has, therefore, been a conscious consideration throughout the project.

3.10.2 Validity

‘Validity’ is another word for truth’ (Silverman, 2010, p.275). It refers to whether a method or research tool ‘actually measures what it is supposed to measure’ (Wellington, 2000, p.30). For the whole study to have validity, all the parts (including the questions and the methods) must fit together (Punch, 2005). In order to facilitate this coherence, this study started with the main research question, and the methods followed on from this. Establishing and revisiting the main and subsidiary research questions during the design of data collection instruments helped to provide checks that the methods were providing the necessary data. The methods were designed to answer the research questions. Working in this order helps to preserve the focus of the study, and to establish methods that serve a question, rather than their own ends.

Getting to the truth behind the claims made on the data, and therefore establishing its validity, will vary according to the method type (Peräkylä, 2011). Therefore, seeking the validity of data from an interview will have differences from seeking validity on observational research. In the case of data from an interview, a key area of establishing validity may be to consider whether the data gathered reflects the interviewee’s views outside of the interview or whether they are just a product of the interview. With observational research, however, validity may focus on how well the researcher’s collected data reflects the reality that was observed (Peräkylä, 2011).

‘There is no foolproof procedure to establish validity’ (Punch, 2014, p.240) and consequently the validation approaches depend on the individual circumstances. In the case of the three methods used in this study, thorough and careful consideration was given to the definitions, categorisations and questions used within the methods. At each stage of the development of the data collection instruments, the conception,
data collection and analysis procedures were carefully contemplated and tested. Additional measures were implemented to try to ensure the validity of the individual methods, so that the instruments measured what they were intended to measure. For example, the SCO set out to capture typical classroom use of the IWB in English lessons. This was made clear to the teachers through meetings and communications with them before embarking on the fieldwork. Where possible, more than one lesson was observed from the teacher, in an attempt to avoid observing a ‘one-off’ lesson, designed especially for the research observation. In the case of the teacher interviews, screenshots of the content from the observed lessons were used to stimulate discussion. Using these screenshots not only provided prompts for discussion, but also helped to keep the focus on the actual content of the lesson, thereby helping to keep the focus on the interview on the actual practice observed.

As each instrument has been designed, it has also been evaluated alongside the other methods – to ensure a coherent data collection across the study.

Within this study, the methods have been piloted to check that they gather the data they are supposed to collect. In the case of the quantitative methods, these were checked to ensure that the variables and their values were focused, workable and probable. Anomalies or issues that arose during the fieldwork have been noted as necessary. Clear guidance notes supported the operation of the methods. In the case of the in-depth interviews, the use of the screenprints, collated from the content analysis, helped to ensure that the direction of the responses was clearly focused on the right material, so that misunderstanding did not occur. Careful coding has also enabled cross-checking of the responses.

3.10.3 Reliability
Like validity, reliability in research data and findings is also dependent on ‘quality control’. It refers to consistency, including ‘consistency over time (or stability) and internal consistency’ (Punch, 2005, p.95). It is allied to the idea of being able to replicate findings should the study be repeated. This is easier to establish with quantitative methods, where the precise procedures and ‘rules’ can be determined beforehand and applied to the data collection. It is perhaps more of an aspiration
than an achievable end, in the case of qualitative methods. Flick (2009) points out that reliability of qualitative data requires explanation in two main respects: firstly, the explication of the data should make it possible to establish what is from the subject and what is from the researcher’s interpretation, and secondly, fieldwork procedures should be explicit and consistent, thereby increasing comparability of the case data. Furthermore, Flick believes that a well-documented and detailed account of the research process will help to increase the reliability of the process, ‘Thus, the criterion of reliability is reformulated in the direction of checking the dependability of data and procedures, which can be grounded in the specificity of the various qualitative methods’ (2009, p. 387).

Within this project, reliability was sought through actions designed to maintain consistency within each method, to apply careful coding and by keeping detailed notes. In the case of the quantitative methods, great care was taken in categorising the areas for data collection. Guidelines or principles were created to help the researcher apply the same criteria to the choice of values in all cases, and these were piloted and checked to ensure that they would work with different situations encountered. Furthermore, both the SCO and the CA methods were designed to work in tandem and to complement each other. Data gleaned from the CA method is designed to build on and develop the inferences made from the SCO data. The interrelation in the source of data for both methods allows a reiterative approach to the data collected from both methods, and when the researcher was analysing the data, a part of the process involved reviewing the data collection forms concurrently to check for errors or anomalies.

In the case of the interviews with the teachers, a consistent approach was devised for the interviewing process, for recording the data and making the transcriptions, and for carrying out the analysis. As the researcher was also the interviewer, it was a straightforward issue to establish consistency of approach in terms of the question framework, the topics pursued and the manner in which questions were posed. This has helped to ensure that the data gathered has a degree of reliability and stability.
3.10.4 Ethics

‘Ethics is the study of what are good, right, or virtuous courses of action’ (Oancea, 2014, p.36). Ethical considerations within a study should ‘override all others’ (Wellington, 2000, p.54) and they have been taken very seriously in this study. The researcher consulted various sources of guidance including that provided by the University of Leicester and the Revised Ethical Guidelines for Educational Research published by BERA (2004). Ethical approval has been sought and granted from the University of Leicester Ethics Committee. Particular consideration has been given to protection of the schools, the practitioners and the students involved in the observations within this study. Consent forms were signed by the headteachers of the schools involved (Appendix F), the teacher participants (Appendix G) and school students (and their parents) (Appendix H) involved in the observations. The consent forms provided information about the nature of the project, the methods used, the use of the data, the rights of the participants, security, anonymity and risks. The teachers were also offered the opportunity to check the data collected via the interview, although none of them requested this. A clear withdrawal process was also delineated although no one who committed to the process actually withdrew.

As classroom observation was a part of this project, consent and information forms were issued to the students within the classes that were observed. These were issued well in advance of the observations to allow time for the teachers to disseminate and collect in the forms. The students’ parents’ consent was also requested. Students were advised that any of their work on the IWB may be used in the project and they were asked to consent to this. Space on the form was given for any queries, and the researcher’s email address was given in case any parent had questions.

Steps have been taken to maintain the anonymity of the schools and teachers involved in this study, by using pseudonyms for the schools and for the teachers. The broad geographical area has been stated as the numbers of schools within this area precludes the schools from being identified. Some personal data has been kept as part of the project, including interviews with teachers, and all of the data and records have been kept in a confidential manner, for example, on password-protected computers.
During the data collection phase, when lesson observations were made, the researcher made efforts to avoid unwarranted disturbance of the lessons observed by locating herself as unobtrusively as possible in the classroom, and avoiding unnecessary interactions with students. The recording of the IWB content was done by means of a small ‘Flip’ camera in front of the teacher’s computer monitor. This avoided having to use a more prominent, and possibly disruptive, video camera and tripod in the classroom. It also avoided the possibility of students being inadvertently recorded. For the interview process, the researcher always used a private room, to ensure confidentiality for the teacher being interviewed.

3.11 Concluding comments

Data has been elicited through the three methods described. The integration and interpretation of this data is vital for a full and detailed picture: ‘The key issue is whether in a mixed methods project, the end product is more than the sum of the individual quantitative and qualitative parts’ (Bryman 2007, p.8). This research project has required the scrutiny of English lessons using IWBs, to better understand the working of IWBs in those lessons. The analysis of this data, drawn from different case study teachers by means of different methods, will be followed by integration of the data in order to answer the research question. The next three chapters will consider the analysis of the data from each of the three chosen methods.
4 DATA ANALYSIS: SYSTEMATIC CLASSROOM OBSERVATION

4.1 An overview

Systematic classroom observation (SCO) has been introduced (Chapter 3.7) as a quantitative method, designed to draw data from a systematic, methodical observation of classroom practice. Within this study, the method is used to gather empirical data on the use of IWBs with the observed lessons of the case study teachers. A total of sixteen lessons were observed by the researcher. These were taught by seven teachers in four schools. A data collection sheet was designed (Appendix A), consisting of two A4 pages. Contextual information about the lesson was first recorded, covering these seven areas:

1. the date
2. time of the lesson
3. school
4. teacher
5. the number of the lesson (with that teacher)
6. year group
7. the make of interactive whiteboard.

During the lesson, coding of data took place (on the data collection sheet) at one-minute intervals within the lessons. Each minute a coding record was made against each of the following variables:

1. the user of the board
2. the intended audience
3. the text preparation
4. the type of content
5. the media used alongside IWB use
6. the ‘on/off’ status of the IWB
7. the function the IWB is serving
8. the cognitive level of the IWB use.
All of the areas and variables were analysed apart from the date and the time of the lesson, which were present for lesson identification purposes. The collected data was analysed with the help of the SPSS data analysis program, which enabled the cross-tabulation of variables against each other. Across the sixteen observed lessons, a total of 859 separate coding records or counts were made at one-minute intervals, and the data from these counts were entered into the program.

The data from the observations were collected in four schools: Amberton, Brightley, Casland and Doversford. The greatest proportion of data was gathered from Brightley and Amberton schools, accounting for nearly 74% between them (Table 4.1). The majority of the observations (12 out of 16) took place in these two schools.

<table>
<thead>
<tr>
<th>School</th>
<th>Counts made (%)</th>
<th>Number of lessons observed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amberton</td>
<td>36.6%</td>
<td>6 lessons</td>
</tr>
<tr>
<td>Brightley</td>
<td>36.9%</td>
<td>6 lessons</td>
</tr>
<tr>
<td>Casland</td>
<td>19.2%</td>
<td>3 lessons</td>
</tr>
<tr>
<td>Doversford</td>
<td>7.3%</td>
<td>1 lesson</td>
</tr>
</tbody>
</table>

Table 4.1: The proportion of individual counts made at each school

Seven teachers were observed: two from Amberton, three from Brightley, and one each from Casland and Doversford (Table 4.2). There were more counts made in Cherry’s lessons (at Casland) than of any other individual teacher, followed by Abigail and Alice from Amberton.
<table>
<thead>
<tr>
<th>School</th>
<th>Teacher</th>
<th>Counts made (%)</th>
<th>Number of lessons observed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amberton</td>
<td>Abigail</td>
<td>18.3%</td>
<td>3 lessons</td>
</tr>
<tr>
<td></td>
<td>Alice</td>
<td>18.3%</td>
<td>3 lessons</td>
</tr>
<tr>
<td>Brightley</td>
<td>Beverley</td>
<td>12.6%</td>
<td>2 lessons</td>
</tr>
<tr>
<td></td>
<td>Bill</td>
<td>6.5%</td>
<td>1 lesson</td>
</tr>
<tr>
<td></td>
<td>Bryn</td>
<td>17.8%</td>
<td>3 lessons</td>
</tr>
<tr>
<td>Casland</td>
<td>Cherry</td>
<td>19.2%</td>
<td>3 lessons</td>
</tr>
<tr>
<td>Doversford</td>
<td>Deborah</td>
<td>7.3%</td>
<td>1 lesson</td>
</tr>
</tbody>
</table>

Table 4.2: The proportion of individual counts made of each teacher

The observed lessons were from years 7 to 11 (Table 4.3). Key stage 3 accounts for nearly 70% of the counts, and Key stage 4 (Years 10 and 11) for 30%, whilst year 7 accounts for the largest number of records of one year group. All year groups (from the 11-16 age group) are represented in the data, although the quantity of data collected about each year group is not balanced.

<table>
<thead>
<tr>
<th>Year group observed</th>
<th>Counts made (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Year 7</td>
<td>38.3%</td>
</tr>
<tr>
<td>Year 8</td>
<td>18.5%</td>
</tr>
<tr>
<td>Year 9</td>
<td>13%</td>
</tr>
<tr>
<td>Year 10</td>
<td>18.4%</td>
</tr>
<tr>
<td>Year 11</td>
<td>11.8%</td>
</tr>
</tbody>
</table>

Table 4.3: The proportion of individual counts made of each year group

The following description of the data analysis will draw out aspects relating to the following areas:

- the board itself
- the IWB users
- the preparation of the texts used on the board
- the stages of the lesson.
4.2 IWBs: type and function

IWBs were frequently used during the observed lessons. Table 4.4 shows the percentages of counts used within the categories used to denote the overall status of the IWB in each observed lesson. The IWBs are always on in the observed lessons. Forty-four percent of the counts indicate that the IWB was the main focus of the observed lesson. They were on, not as the main focus but showing content relevant to the lesson for over 50% of the lesson. Such a high rate of use must be influenced by the fact that the lessons were explicitly observed for IWB use.

<table>
<thead>
<tr>
<th>IWB status</th>
<th>Percentage of counts</th>
</tr>
</thead>
<tbody>
<tr>
<td>On, but not in use</td>
<td>5.1%</td>
</tr>
<tr>
<td>On, with relevant material, in background</td>
<td>51%</td>
</tr>
<tr>
<td>Main focus</td>
<td>43.9%</td>
</tr>
</tbody>
</table>

Table 4.4: The status of the IWB within the observed lessons

The two main brands of IWB were observed: Promethean accounting for 56% of the counts and Smartboard accounting for 44%. This does not reflect the IWB market as a whole, where Smartboards are the market leader (Lloyd, 2011). Nevertheless, it allows a consideration of how both makes of IWB are used by the sample teachers.

The make of the IWB (Promethean or Smartboard) was considered alongside other variables from the data collections, including the main function of the IWB. The researcher has established four main functions for the use of IWBs (see Chapter 2.7 above). All of the functions were observed (see Figure 4.1) apart from ‘resource management’ (referring to the management of files for saving files, etc.).
The main function observed on both boards was *display/broadcast* (75% of Promethean counts, and 80% of Smartboard counts) (Table 4.5). There were more counts of *manipulation of materials* on Smartboard (8%) than with Promethean (6%). Promethean elicited more coding records for *writing/annotation* (19%) than Smartboard (12%). It may be that Smartboards are seen as more conducive to manipulation of materials, as they allow users to move items using finger contact with the board. Both boards have writing tools, however, so it is unclear as to why more writing takes place on the Promethean boards.

**Table 4.5**: Pivot table showing counts on IWB type relating to IWB function

<table>
<thead>
<tr>
<th>Function of IWB</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>display/broadcast</td>
<td>59</td>
</tr>
<tr>
<td>writing/annotation</td>
<td>26</td>
</tr>
<tr>
<td>manipulation of materials</td>
<td>9</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>377</strong></td>
</tr>
</tbody>
</table>

**Figure 4.1**: The percentage of counts made of each function
All four schools were broadly similar when it came to the main function for which they used the IWBs, following the overall trend observed in Figure 4.1. The majority of use was for display/broadcast and ranged from 67% (Doverford) to 83% (Brightley). Differences in the writing/annotation variable were the widest, ranging from 7% (Brightley) to 33% (Doverford). The least observed function - manipulation of materials - ranged from 10% of use at Brightley to 0% at Doversford.

As well as considering the main functions, the type of content used on both boards was examined, for evidence of consistency or variance. As might be imagined, there are many permutations of content that can be seen on an IWB. Within the schools seen in this study, the content of both board types was heavily text based (text in this method, meaning written text). Text (including text with other types of content) accounts for 86% of the content observed (Figure 4.2). Text, on its own, was the most counted content on Smartboards accounting for 51% of the total content on Smartboards, followed by 17% text and still image. The situation was reversed in the case of Promethean IWBs. Here text and still image was the main type of content, accounting for 44% of the content on Promethean IWBs, with text alone making up 36% of the recorded codings on Promethean. The Promethean users alone employed timers (9% of all Promethean content) whereas Smartboard users used DVD/video (14% of Smartboard use). Within a study of this size, it is impossible to say whether the different IWBs are more conducive to certain types of content, or whether the differences are merely due to teachers’ particular preferences/ways of working or other factors. However, they do reveal the predominance of written text and that different practitioners within the study take a variety of approaches.
The content of the IWBs was also examined with a view to examining the teachers’ levels of preparation in using IWBs. Other studies have looked at related issues. In a larger study, Moss et al. found that the majority of teachers report having prepared their own resources for use on IWBs, and the researchers suggest that ‘being reliant on creating their own resources may lead to a more conservative use’ (2007, p.24). Examining the level of preparation of the materials may give insight into the flexibility of the lesson. This study, therefore, was concerned with teachers’ preparedness and flexibility. Text was coded as follows:

- **fully prepared**: prepared prior to the lesson (e.g. a PowerPoint, a game, a DVD)
- **partly prepared**: partially prepared and requiring additional material (e.g. a framework for completion by the teacher)
- **created in class**: a text created wholly in class (e.g. a poem written together)
The significant consideration here, is whether the text used is assembled during the lesson or not; this may impact on the flexibility of the lesson, as a fully prepared text may be less adaptable than a partially prepared text.

The majority (83%) of the texts observed were fully prepared (Figure 4.3), and of this 32% were text only whilst 25% was text and still image. Fourteen percent were partially prepared and only 3% were created in class. Of the partially prepared texts, 8% were text only and 6% were text and still image. Those resources created in class, were all text only resources. So teachers will prepare a whole range of resources for use in class including moving images, audio, animation and timers, but will only create texts in class that consist of written text, perhaps due to teacher levels of competence and confidence in creating resources.

Prepared resources allow information to be presented quickly to the class. In the case of instructions or explanations, for example, students no longer have to wait for text to be written on the board – instead it is displayed instantly. Prepared resources may have benefits such as greater efficiency in the flow of the lesson and lower expenditure on resources if resources do not need to be photocopies. However, there may also be negative aspects, such as the lack of time for students to absorb information and less flexibility within the lesson.

![Text preparation](image)

**Figure 4.3: The levels of text preparation in all lessons observed**

The preparation of texts was also considered alongside the cognitive function of the texts used. The main cognitive level of fully prepared text was comprehension (44%) followed by knowledge (30%). The pattern is different for partially prepared texts
where the main cognitive level of the texts used was aimed at *application* skills (47%). Similarly, although there were comparatively far fewer observations of *texts created in class*, the main cognitive focus for these texts was also *application* (58%).

The type of text preparation was also considered in relation to board type (Table 4.6). For both board types, *fully prepared* texts formed the greatest proportion of content; Smartboard had a greater proportion (90%) than Promethean (76%). The main differences observed were in the *partially prepared text* which accounted for 20% of Promethean text preparation as against the 7% of Smartboard’s text preparation. Two teachers account for most of the Promethean figure. With texts created in class, the proportions are low and similar (Promethean: 4%, Smartboard: 3%). In the main, prepared texts are used, indicating a focus on high levels of preparation when using IWBs. These patterns relate to the tendency noted above (Figure 4.1), for teachers to use IWBs to display/broadcast; the teachers use highly prepared resources for the purpose of display.

<table>
<thead>
<tr>
<th>IWB type * Text preparation Crosstabulation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Text preparation</td>
</tr>
<tr>
<td>Fully prepared text</td>
</tr>
<tr>
<td>---------------------------------------------</td>
</tr>
<tr>
<td>IWB type Promethean Count</td>
</tr>
<tr>
<td>Count</td>
</tr>
<tr>
<td>152</td>
</tr>
<tr>
<td>40</td>
</tr>
<tr>
<td>7</td>
</tr>
<tr>
<td>199</td>
</tr>
<tr>
<td>% within IWB type</td>
</tr>
<tr>
<td>76.4%</td>
</tr>
<tr>
<td>20.1%</td>
</tr>
<tr>
<td>3.5%</td>
</tr>
<tr>
<td>100.0%</td>
</tr>
<tr>
<td>% within Text preparation</td>
</tr>
<tr>
<td>48.7%</td>
</tr>
<tr>
<td>75.5%</td>
</tr>
<tr>
<td>58.3%</td>
</tr>
<tr>
<td>52.8%</td>
</tr>
<tr>
<td>% of Total</td>
</tr>
<tr>
<td>40.3%</td>
</tr>
<tr>
<td>10.6%</td>
</tr>
<tr>
<td>1.9%</td>
</tr>
<tr>
<td>52.8%</td>
</tr>
<tr>
<td>Smartboard Count</td>
</tr>
<tr>
<td>Count</td>
</tr>
<tr>
<td>160</td>
</tr>
<tr>
<td>13</td>
</tr>
<tr>
<td>5</td>
</tr>
<tr>
<td>178</td>
</tr>
<tr>
<td>% within IWB type</td>
</tr>
<tr>
<td>89.9%</td>
</tr>
<tr>
<td>7.3%</td>
</tr>
<tr>
<td>2.8%</td>
</tr>
<tr>
<td>100.0%</td>
</tr>
<tr>
<td>% within Text preparation</td>
</tr>
<tr>
<td>51.3%</td>
</tr>
<tr>
<td>24.5%</td>
</tr>
<tr>
<td>41.7%</td>
</tr>
<tr>
<td>47.2%</td>
</tr>
<tr>
<td>% of Total</td>
</tr>
<tr>
<td>42.4%</td>
</tr>
<tr>
<td>3.4%</td>
</tr>
<tr>
<td>1.3%</td>
</tr>
<tr>
<td>47.2%</td>
</tr>
<tr>
<td>Total Count</td>
</tr>
<tr>
<td>Count</td>
</tr>
<tr>
<td>312</td>
</tr>
<tr>
<td>53</td>
</tr>
<tr>
<td>12</td>
</tr>
<tr>
<td>377</td>
</tr>
<tr>
<td>% within IWB type</td>
</tr>
<tr>
<td>82.8%</td>
</tr>
<tr>
<td>14.1%</td>
</tr>
<tr>
<td>3.2%</td>
</tr>
<tr>
<td>100.0%</td>
</tr>
<tr>
<td>% within Text preparation</td>
</tr>
<tr>
<td>100.0%</td>
</tr>
<tr>
<td>100.0%</td>
</tr>
<tr>
<td>100.0%</td>
</tr>
<tr>
<td>100.0%</td>
</tr>
<tr>
<td>% of Total</td>
</tr>
<tr>
<td>82.8%</td>
</tr>
<tr>
<td>14.1%</td>
</tr>
<tr>
<td>3.2%</td>
</tr>
<tr>
<td>100.0%</td>
</tr>
</tbody>
</table>

Table 4.6: Pivot table showing the counts on IWB type relating to Text Preparation
The cognitive level of work taught was considered for both types of board (Table 4.7). The cognitive level was judged using Bloom’s Taxonomy’s classification (Bloom, Engelhart, Furst, Hill and Krathwohl, 1956). When coding on this variable, the researcher/observer had to make a judgement on the cognitive level of the work. This made this variable different from other variables where no real judgement was required. If the task observed required more than one cognitive level, the prevalent cognitive level was counted. The fact that judgements were necessary, and that another observer might conceivably make a different judgement, makes this a less reliable variable; systematic observation depends upon being able to replicate the results whomever is the observer. This aspect should, therefore, be borne in mind whilst considering the data produced.

The cognitive level was judged using Bloom’s Taxonomy’s classification (Bloom, Engelhart, Furst, Hill and Krathwohl, 1956). When coding on this variable, the researcher/observer had to make a judgement on the cognitive level of the work. This made this variable different from other variables where no real judgement was required. If the task observed required more than one cognitive level, the prevalent cognitive level was counted. The fact that judgements were necessary, and that another observer might conceivably make a different judgement, makes this a less reliable variable; systematic observation depends upon being able to replicate the results whomever is the observer. This aspect should, therefore, be borne in mind whilst considering the data produced.

<table>
<thead>
<tr>
<th>IWB type</th>
<th>Cognitive level of material Crosstabulation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Count</td>
</tr>
<tr>
<td>Promethean</td>
<td>59</td>
</tr>
<tr>
<td>% within IWB type</td>
<td>29.6%</td>
</tr>
<tr>
<td>% within Cognitive level of material</td>
<td>60.2%</td>
</tr>
<tr>
<td>% of Total</td>
<td>15.6%</td>
</tr>
<tr>
<td>Smartboard</td>
<td>39</td>
</tr>
<tr>
<td>% within IWB type</td>
<td>21.9%</td>
</tr>
<tr>
<td>% within Cognitive level of material</td>
<td>39.8%</td>
</tr>
<tr>
<td>% of Total</td>
<td>10.3%</td>
</tr>
<tr>
<td>Total</td>
<td>98</td>
</tr>
<tr>
<td>% within IWB type</td>
<td>26.0%</td>
</tr>
<tr>
<td>% within Cognitive level of material</td>
<td>100.0%</td>
</tr>
<tr>
<td>% of Total</td>
<td>26.0%</td>
</tr>
</tbody>
</table>

Table 4.7: Pivot table showing counts on IWB relating to cognitive level
Comprehension was the main cognitive area observed in the lessons, accounting for 40% of all counts across the observed lessons, and followed by knowledge (26%) and application (21%) (Figure 4.4).

Figure 4.4: The percentage of counts made for each cognitive level

Comprehension was recorded most frequently for both makes of board. On Promethean IWBs the next most observed cognitive level was knowledge (30%) and with Smartboards it was application (26%). Promethean IWBs were more likely to be used for analysis, as they account for 72% of analysis records, as opposed to 28% on Smartboard. Across both makes of board, there was only one count of evaluation. There were no coding records for either board of synthesis. This does not mean that there was no example of synthesis in the lessons observed, as the cognitive level was only recorded in relation to IWB use. The reminder of the lesson, where the IWB was not used, may have developed higher level cognitive skills. However, it does seem to indicate that the higher cognitive level was not often used when the IWB were the main focus of the lesson.

When considering the individual schools, comprehension was the single most popular count in three schools (Amberton 38%, Brightley 50%, Casland 34%). The exception was Doverford where comprehension (22%) came second to application, accounting for 69% of the coding records made at that school. Such a high count in one area may be accounted for by the fact that only one lesson was observed in Doversford, and so
there may be a lack of breadth in the observations. However, in the case of each school, there were more counts of comprehension than knowledge made. Analysis was observed in all schools apart from Doversford and accounted for between 9% (Brightley) and 25% (Casland) of the counts in individual schools. Only two counts were made of evaluation within the schools, one in Amberton and one in Doversford.

The type of user was also considered in relation to board type. Teachers are the main users. Pupil use accounted for 19% of the total use (Table 4.8). Of this amount, 14% of use was on a Smartboard and 5% on a Promethean board. Although the overall number of counts is quite small, and it therefore unwise to extrapolate too much into the figures, the proportion of codings recorded may indicate that the Smartboard is perceived as more pupil-friendly.

<table>
<thead>
<tr>
<th>IWB user * IWB type Crosstabulation</th>
<th>IWB type</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Promethean</td>
<td>Smartboard</td>
<td>Total</td>
</tr>
<tr>
<td>teacher alone</td>
<td>Count</td>
<td>178</td>
<td>124</td>
</tr>
<tr>
<td></td>
<td>% within IWB user</td>
<td>58.9%</td>
<td>41.1%</td>
</tr>
<tr>
<td></td>
<td>% within IWB type</td>
<td>89.4%</td>
<td>69.7%</td>
</tr>
<tr>
<td></td>
<td>% of Total</td>
<td>47.2%</td>
<td>32.9%</td>
</tr>
<tr>
<td>pupil alone</td>
<td>Count</td>
<td>19</td>
<td>53</td>
</tr>
<tr>
<td></td>
<td>% within IWB user</td>
<td>26.4%</td>
<td>73.6%</td>
</tr>
<tr>
<td></td>
<td>% within IWB type</td>
<td>9.5%</td>
<td>29.8%</td>
</tr>
<tr>
<td></td>
<td>% of Total</td>
<td>5.0%</td>
<td>14.1%</td>
</tr>
<tr>
<td>teacher and pupil</td>
<td>Count</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>% within IWB user</td>
<td>100.0%</td>
<td>.0%</td>
</tr>
<tr>
<td></td>
<td>% within IWB type</td>
<td>1.0%</td>
<td>.0%</td>
</tr>
<tr>
<td></td>
<td>% of Total</td>
<td>.5%</td>
<td>.0%</td>
</tr>
<tr>
<td>pupil and pupil(s)</td>
<td>Count</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>% within IWB user</td>
<td>.0%</td>
<td>100.0%</td>
</tr>
<tr>
<td></td>
<td>% within IWB type</td>
<td>.0%</td>
<td>.6%</td>
</tr>
<tr>
<td></td>
<td>% of Total</td>
<td>.0%</td>
<td>.3%</td>
</tr>
<tr>
<td>Total</td>
<td>Count</td>
<td>199</td>
<td>178</td>
</tr>
<tr>
<td></td>
<td>% within IWB user</td>
<td>52.8%</td>
<td>47.2%</td>
</tr>
<tr>
<td></td>
<td>% within IWB type</td>
<td>100.0%</td>
<td>100.0%</td>
</tr>
<tr>
<td></td>
<td>% of Total</td>
<td>52.8%</td>
<td>47.2%</td>
</tr>
</tbody>
</table>

Table 4.8: Pivot table showing counts on IWB type relating to IWB user
4.3 IWB use within different schools

Conducting the study in four different schools provides the opportunity to look for patterns of practice between the schools. It should be borne in mind when looking at the data which relates to schools, that the highest percentage of counts per school, was made at Brightley (37%) and the smallest percentage was at Doversford (7%). As different numbers of teachers and lessons were observed in each school, and the schools are in different settings and contexts, it is impossible to make direct comparisons between the schools. However, looking at school practice and at the proportions of particular occurrences in each school provides some insight into different approaches.

An analysis of the nature of text preparation was considered for each school (Table 4.9). The highest number of counts was at Brightley. As a percentage of its total use, Brightley had the highest proportion of fully prepared texts (94%) in use. It also had the lowest number of partially prepared texts (less than 1%). The three teachers at Brightley, therefore, usually made use of materials that had been fully prepared by themselves or publishers. Of the other schools, the majority of texts were fully prepared, with some partially prepared. Observations of texts created in class were made in only Brightley and Casland, accounting for only 3% of the total coding records. This data indicates that the tendency to use the IWB for fully prepared texts is common to all the schools in the study.

The type of IWB content was also investigated, to see if schools have similar proportions of content type. Textual (written) content is strongly featured in all of the case study schools’ content. However, there are differences between the schools when considering content that is written text only, and written text and still image. In the case of both Casland and Doversford, over two-thirds of their content is written text only. With the other two schools, Brightley’s content includes 25% that is written text and still image, and Ambertons’s written text and image content is nearly 60%. There was a contrast between schools that are written text only and those that use
written text and still image. It suggests that practice may be common to departments - that teachers may be developing a department house-style.

School * Text preparation Crosstabulation

<table>
<thead>
<tr>
<th>School</th>
<th>Count</th>
<th>Text preparation</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>fully prepared text</td>
<td>partially prepared text</td>
</tr>
<tr>
<td>Amberton</td>
<td>109</td>
<td>23</td>
<td>0</td>
</tr>
<tr>
<td>% within School</td>
<td>82.6%</td>
<td>17.4%</td>
<td>.0%</td>
</tr>
<tr>
<td>% within Text preparation</td>
<td>34.9%</td>
<td>43.4%</td>
<td>.0%</td>
</tr>
<tr>
<td>% of Total</td>
<td>28.9%</td>
<td>6.1%</td>
<td>.0%</td>
</tr>
<tr>
<td>Brightley</td>
<td>134</td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td>% within School</td>
<td>94.4%</td>
<td>2.1%</td>
<td>3.5%</td>
</tr>
<tr>
<td>% within Text preparation</td>
<td>42.9%</td>
<td>5.7%</td>
<td>41.7%</td>
</tr>
<tr>
<td>% of Total</td>
<td>35.5%</td>
<td>.8%</td>
<td>1.3%</td>
</tr>
<tr>
<td>Casland</td>
<td>43</td>
<td>17</td>
<td>7</td>
</tr>
<tr>
<td>% within School</td>
<td>64.2%</td>
<td>25.4%</td>
<td>10.4%</td>
</tr>
<tr>
<td>% within Text preparation</td>
<td>13.8%</td>
<td>32.1%</td>
<td>58.3%</td>
</tr>
<tr>
<td>% of Total</td>
<td>11.4%</td>
<td>4.5%</td>
<td>1.9%</td>
</tr>
<tr>
<td>Doversford</td>
<td>26</td>
<td>10</td>
<td>0</td>
</tr>
<tr>
<td>% within School</td>
<td>72.2%</td>
<td>27.8%</td>
<td>.0%</td>
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<td>% within Text preparation</td>
<td>8.3%</td>
<td>18.9%</td>
<td>.0%</td>
</tr>
<tr>
<td>% of Total</td>
<td>6.9%</td>
<td>2.7%</td>
<td>.0%</td>
</tr>
<tr>
<td>Total</td>
<td>312</td>
<td>53</td>
<td>12</td>
</tr>
<tr>
<td>% within School</td>
<td>82.8%</td>
<td>14.1%</td>
<td>3.2%</td>
</tr>
<tr>
<td>% within Text preparation</td>
<td>100.0%</td>
<td>100.0%</td>
<td>100.0%</td>
</tr>
</tbody>
</table>

Table 4.9: Pivot table showing the type of text preparation within each school

4.4. Teachers' patterns of use

As has been noted previously (Figure 4.3), the overall tendency is for prepared texts to be used on the IWB. This pattern is replicated by the individual teachers (Table 4.10). With each of the seven teachers, the majority of texts used on the IWB were fully
prepared. This ranged from 100% with two teachers (Bill and Bryn) to 64% with Cherry.

<table>
<thead>
<tr>
<th>Teacher</th>
<th>Count</th>
<th>fully prepared text</th>
<th>partially prepared text</th>
<th>created in class</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abigail</td>
<td>54</td>
<td>78.3%</td>
<td>17.3%</td>
<td>14.3%</td>
<td>69</td>
</tr>
<tr>
<td></td>
<td>15</td>
<td>21.7%</td>
<td>4.0%</td>
<td>0.0%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>0</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>69</td>
<td>100.0%</td>
<td>18.3%</td>
<td>18.3%</td>
<td></td>
</tr>
<tr>
<td>Alice</td>
<td>55</td>
<td>87.3%</td>
<td>17.6%</td>
<td>14.6%</td>
<td>63</td>
</tr>
<tr>
<td></td>
<td>8</td>
<td>12.7%</td>
<td>5.7%</td>
<td>2.1%</td>
<td></td>
</tr>
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<td>0</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>63</td>
<td>100.0%</td>
<td>16.7%</td>
<td>16.7%</td>
<td></td>
</tr>
<tr>
<td>Beverley</td>
<td>24</td>
<td>75.0%</td>
<td>7.7%</td>
<td>6.4%</td>
<td>32</td>
</tr>
<tr>
<td></td>
<td>3</td>
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<td>5.7%</td>
<td>8.5%</td>
<td></td>
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<td></td>
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<td>15.6%</td>
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<td>13.8%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>32</td>
<td>100.0%</td>
<td>8.5%</td>
<td>10.6%</td>
<td></td>
</tr>
<tr>
<td>Bill</td>
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<td>12.8%</td>
<td>10.6%</td>
<td>40</td>
</tr>
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<td>0%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>40</td>
<td>100.0%</td>
<td>10.6%</td>
<td>10.6%</td>
<td></td>
</tr>
<tr>
<td>Bryn</td>
<td>70</td>
<td>100.0%</td>
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<td>18.6%</td>
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<td>0%</td>
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<tr>
<td></td>
<td>70</td>
<td>100.0%</td>
<td>18.6%</td>
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<tr>
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<td>11.4%</td>
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<td>36</td>
</tr>
<tr>
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<td></td>
</tr>
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<td></td>
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<td>0%</td>
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<td></td>
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<td>100.0%</td>
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<td></td>
</tr>
<tr>
<td></td>
<td>377</td>
<td>100.0%</td>
<td>100.0%</td>
<td>100.0%</td>
<td></td>
</tr>
</tbody>
</table>

Table 4.10: Pivot table showing counts on teachers relating to text preparation
Five of the teachers made use of partially prepared texts, with proportions of use ranging from 9% to 28% of their total use. Only two teachers (Beverley and Cherry) created materials from scratch in the classroom. These materials, from both teachers, account for just over 3% of the total text used on the IWB by all teachers, so it is a relatively small proportion. All of the teachers observed generally prepared the texts they used on the IWB and the majority did not prepare materials during the lesson itself. This pattern indicates that the teachers were not using the IWB as a traditional whiteboard which is often used for the writing of notes during the course of the lesson (Greiffenhagen, 2000). However, they were using it as a piece of screen technology, to present previously prepared resources. This marks a significant difference in use to a traditional white or blackboard, where only a limited amount of text can be prepared, and texts are often created during the lesson - in 'real time'.

It has already been noted that the two main constituent elements of IWB content observed were written text alone and written text and still image. The data relating to individual teachers was also examined. Three teachers (Abigail, Alice and Bryn) made greater use of written text and still image than of written text alone, markedly so in the case of Alice where 76% of her content was text and still image. It seems that these teachers were making a conscious choice to include still images in their IWB content.

Of the other main types of content used, two teachers made use of moving image and sound (through video): Beverley (41% of her content) and Deborah (31% of her content). Bill made considerable use of games/quizzes (35% of his content) and timers (clocks displayed on the IWB to count down time available) were used by both Abigail and Alice. There are indications that colleagues within schools use the same types of content. For example, Abigail and Alice from Amberton both make extensive use of written text and still image, and they both used timers. The proportions of written text used are similar by the teachers at Brightley School (50%, 53%, 40%). Consequently, colleagues in within the same department may influence each other in the types of content they use on the IWB.
The data about teacher use was also investigated to see if teachers made use of different media or supplementary resources alongside the IWB (Figure 4.5). Other types of media were used alongside IWBs in 37% of the observations which have active use of the IWB. The most popular other media with six of the seven teachers was text/book/worksheet, accounting for 79% of the other media counts. Four of the teachers (Alice, Bryn, Cherry and Deborah) used no other media apart from these. Traditional whiteboards were used only by Beverley and Bryn. Abigail made the most use of other media. As well as text/book/worksheet, she used a traditional whiteboard, post-it notes, a prop (ball) and the Internet (accessed via a laptop).

Overall, however the use of other media/resources with the IWB was quite limited.

![Figure 4.5: The number of counts for other media used alongside IWBs](image)

The cognitive level of the work done on the IWB by teachers was also explored. As has been noted above, comprehension was the cognitive level reached for much IWB use. There were some variations between teachers. In the lessons of Abigail and Beverley, knowledge was the most frequently noted cognitive level. Comprehension was observed most frequently in the lessons of three teachers (Alice, Bryn and Cherry), whilst application was most frequently counted in the lessons of Bill and Deborah. No teacher dealt with synthesis and only one teacher (Abigail) showed all the other five cognitive levels in her lessons.
The cognitive level of the work was only recorded whilst the IWB was being actively used. The decision of the researcher not to record the cognitive level of the work throughout the lesson was possibly a missed opportunity. Collecting the data on the cognitive level of the work in all parts of the lesson might have enabled a comparison between the parts of the lesson where the IWB was used and when it was not, and this would provide better insight into how the IWB is being used by teachers.

4.5 IWB use within different year groups

The data was interrogated to see if there were different patterns of IWB use with different age groups. Direct comparisons are not possible between age or year groups because the number of observations within each year group differed (see Table 4.3). All year groups were observed for at least two lessons. Year 7 were observed more than any other year group, accounting for over a third of the coding records over the course of six lessons.

The year group variable was examined in relation to the 'on/off status' variable which indicates when the board is on or off, and if on, whether it is the main focus of the lesson or not (Table 4.11). In the case of year 7 and year 8 lessons, the IWBs always had lesson material displayed, even when this material was not the main focus of the teaching. Year 7, the most observed year group, had the IWB as the main focus of the lesson for 40% of the time, with the IWB on and containing lesson materials in the background for the remaining 60% of the time. This would suggest that the IWB is a central teaching resource for these lessons. Year 10 lessons showed less direct use of the IWB (i.e. as the main focus) than other year groups, being the main focus of work for 37% of the coding records. Year 10 also had the greatest number and percentage (19%) of the year group's counts for when the IWB was on but not displaying anything relevant to the lesson. However, the number of counts of the IWB being on but not used in any way is small, accounting for just 5% of the total counts for all year groups. The IWB was the main focus for 50% of the coding records for year 8, year 9 and year 11. Across all year groups, the IWB was on and actively used for 44% of the counts.
made, and remained on with relevant materials displayed for 51% of the counts made. The usual pattern in the sample lessons is for the IWB to be on during the whole lesson and displaying relevant materials most of the time.

<table>
<thead>
<tr>
<th>Year Group</th>
<th>Count</th>
<th>on but not in use</th>
<th>on with material in background</th>
<th>main focus</th>
<th>Total</th>
</tr>
</thead>
<tbody>
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<td>196</td>
<td>133</td>
<td>329</td>
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<tr>
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<td>59.6%</td>
<td>40.4%</td>
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</tr>
<tr>
<td>% within IWB status</td>
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<td>35.3%</td>
<td>38.3%</td>
<td></td>
</tr>
<tr>
<td>% of Total</td>
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<td>15.5%</td>
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</tr>
<tr>
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<td>80</td>
<td>79</td>
<td>159</td>
</tr>
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<td>% within Year group</td>
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<td>49.7%</td>
<td>100.0%</td>
<td></td>
</tr>
<tr>
<td>% within IWB status</td>
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<td>18.3%</td>
<td>21.0%</td>
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<td></td>
</tr>
<tr>
<td>% of Total</td>
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<td>9.2%</td>
<td>18.5%</td>
<td></td>
</tr>
<tr>
<td>Year 9</td>
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<td>7</td>
<td>49</td>
<td>56</td>
<td>112</td>
</tr>
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<td>50.0%</td>
<td>100.0%</td>
<td></td>
</tr>
<tr>
<td>% within IWB status</td>
<td>15.9%</td>
<td>11.2%</td>
<td>14.9%</td>
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<td></td>
</tr>
<tr>
<td>% of Total</td>
<td>.8%</td>
<td>5.7%</td>
<td>6.5%</td>
<td>13.0%</td>
<td></td>
</tr>
<tr>
<td>Year 10</td>
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<td>% within Year group</td>
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</tr>
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<td>6.9%</td>
<td>18.4%</td>
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<td>50</td>
<td>101</td>
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<td>% within Year group</td>
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<td>49.5%</td>
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<td></td>
</tr>
<tr>
<td>% within IWB status</td>
<td>15.9%</td>
<td>10.0%</td>
<td>13.3%</td>
<td>11.8%</td>
<td></td>
</tr>
<tr>
<td>% of Total</td>
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<td>100.0%</td>
<td></td>
</tr>
<tr>
<td>% within IWB status</td>
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<td>100.0%</td>
<td>100.0%</td>
<td>100.0%</td>
<td></td>
</tr>
<tr>
<td>% of Total</td>
<td>5.1%</td>
<td>51.0%</td>
<td>43.9%</td>
<td>100.0%</td>
<td></td>
</tr>
</tbody>
</table>

Table 4.11: Pivot table showing the counts for each year group relating to IWB status

The cognitive level of materials used was also viewed alongside the year group variable, with a view to considering whether different cognitive levels were associated with different year groups (Table 4.12).
As has already been noted, *comprehension*-focused material was the main cognitive level used on the IWBs and *comprehension* was used significantly across all year groups.
groups but particularly so in years 10 and 11, where it made up 54% and 78%, respectively, of the total cognitive level materials with those years. Material at the level of application was seen most often with years 7 to 9. Analysis was seen in all year groups, but particularly so in year 7 (where 39% of analysis counts were made) and year 8 (33% of analysis counts). It may be that analysis appears most strongly in these year groups as more observations were made in years 7 and 8, meaning a wider range of cognitive skills is likely to be observed. Alternatively the IWB may not be considered a suitable tool for the level and depth of analysis carried out in older year groups.

### 4.6 IWB user and audience

The data was investigated for patterns of use relating to the user. The teacher alone was the main user, accounting for 80% of the observations, with a pupil alone accounting for 19% of the observations. Usage according to board type was also investigated, and in particular whether pupils are more likely to be seen using one board type. The two IWB brands observed were Promethean and Smartboard, the former accounting for 53% of observations leaving the latter with 47% of observations. Of the 19% of observations involving lone pupils, 5% was with a Promethean board and 14% was with a Smartboard. So in this study, although there was slightly more use of Promethean boards overall, when pupils were seen using an IWB, it was more likely to be with a Smartboard. This may indicate that teachers are more likely to allow pupils to use a Smartboard, or that they are perceived as more pupil-friendly perhaps. This may be to do with the slightly different operational features of each board. For example, the Smartboard has a range of ‘pens’ and an eraser, whilst the Promethean board has one stylus, and having one stylus to perform all actions may be perceived as more demanding.

When considering the cognitive level of the material used by teacher and pupil users, both groups used the IWB mainly for work focused on comprehension, with it counting for 38% of all teacher alone use and 51% of pupil alone use. The second most popular cognitive focus for a pupil alone was application at 29% of pupil alone use, whereas
teachers focused on *knowledge* next (29%). Teachers were more likely to use the IWB for *analysis* (13%) than pupils alone (7%).

When it comes to the relationship between the user and the function of the IWB, the majority of use within both groups was for *display/broadcast*, with it counting for 84% of *teacher alone* use and 51% of *pupil alone* use. Proportionally, pupils working alone at the board do more writing than teachers (29% of *pupil alone* use, compared with 13% of *teacher alone* use) and also perform more manipulation of materials (19% of *pupil alone*; 4% of *teacher alone*). So there are differences in use, which may be because teachers set specific tasks (e.g. text completion) for pupils to do.

Overall, teachers are the main users accounting for 80% of user counts and the class is the main audience. Considering the variables together for both IWB status and the IWB audience showed that, when the IWB is the main focus of class work, the intended audience is the whole class in 88% of the observations made (Figure 4.6). There were 3 main audiences: whole class, selected pupil, teacher. Teacher audience mainly occurred when pupils presented to the teacher alone. The teacher was the audience for 10% of the observations, and this mainly related to one lesson where pupils were presenting to the teacher alone. Only very occasionally (under 2% of observations) was the IWB used just with a selected pupil(s).

![Figure 4.6: The percentage of counts for each audience type](image)

**4.7 Lesson stages**

In order to gain an accessible picture of what was happening at different stages of a lesson, a new variable was created. This *ten-minute sections* variable arranges the
minute variable into ten-minute blocks. This enables the consideration of data and patterns at different stages of the lesson, e.g. the opening ten minutes. As each lesson varies in length, there is not the same number of blocks of time in every observed lesson and care should be taken when looking at the closing parts of lessons in particular.

Initially, this variable was used with the IWB status variable, to see if IWBs tend to be used at particular times in a lesson. The heaviest use, when the IWB is the main focus, is generally at the start of a lesson. Twenty-eight percent of observations showing the IWB to be the main focus are in the first ten minutes. This reduces slightly to 27% in the second block, and drops to 10% in the fourth block (minutes 31-40) of the lesson. There is a slight increase in the fifth block to 13%. Overall the overall pattern of use shows that the IWB is most frequently used during the first third of a lesson, with some recurrence of frequency in the final ten-minutes of a lesson.

The lesson stages were all analysed alongside the preparation of texts, to see whether differently prepared texts are used at particular stages of a lesson (Figure 4.7). When fully prepared texts are used, the majority of use (58%) was observed during the first two ten-minute blocks of the lessons. In the case of partially prepared texts, most of this use was observed in the second and fourth blocks (34% in each case), indicating that this type of use is seen as applicable to the main body of the lesson. Where texts were created in class, this was usually seen in the latter part of the lesson (minutes 41-50) indicating that this type of use may be used for plenary and summing up activities.
4.8 Concluding comments

Data from the SCOs of selected English teachers has established a foundation for considering the use of IWBs in the English classroom (and for the other two methods in this study). In particular, it has begun to shed light on the nature of the IWB itself, the users and the audience for IWB use, the nature of the content on the IWB and the stages of the lessons when IWBs are used. The implications of that data presented here will be explored in detail in Chapter 7. The next chapter will consider the next method: the analysis of the content of the IWBs used in the observed lessons.
5 DATA ANALYSIS: CONTENT ANALYSIS

5.1 An overview

With its large screen, usually sited at the front of the classroom so that all pupils can see the content, the IWB is focused particularly on the visual. Consequently, examining the screen content is an important aspect of understanding how IWBs support English teaching. Investigating the content on IWBs is, therefore, an important part of this study.

The design and operation of this method has been described previously (Chapter 3.8.2 and 3.8.3). Within this study, content analysis (CA) is deemed to be a quantitative approach, following the approach of Bell (2004) who uses CA as a systematic approach for analysing content whereby the researcher categorises and quantifies aspects of observable content. For Bell, CA is not about analysing individual images, as might be done using semiotic methods for example, but it is concerned with describing 'fields of visual representation by describing the constituents of one or more defined areas of representation, periods or types of images' (2004, p.14). Such a description must refer back to the research questions. Within this study, the questions relate to how IWB content supports teaching and instruction within a secondary English context, and how the teachers use IWBs to support this teaching and learning. Specifically, the CA tool was designed to address the following areas and questions:

1. The creator of the texts
   - Who is the writer or originator of each text?
   - Do teachers have apparent preferences for one creator over another?

2. The nature and composition of the texts
   - What type of texts do the English teachers use on the IWB?
   - What are the main compositional elements of the texts?

3. The pedagogic focus for each text
   - At what stage in the teaching are IWB texts used for teaching?
   - What English skills and study areas are the focus of IWB use in English?
The creation of variables and their values, has enabled data from the IWBs content to be quantified and sorted. Technical issues have meant that data could not be used from two of the sixteen observed lessons (see Chapter 3.8.3). There are limits on the scope of statistical analysis from a small sample, where the variables are mainly categorical (as opposed to continuous), but the method does allow the measurement of the data gathered and does allow some objective consideration of the variables and values, and their relationships which will be explored in this chapter.

As well as enabling a description of the content of IWBs in the study, CA has facilitated consideration of the multimedia aspects of IWB technology. Understanding the implications of a multimedia approach is particularly important for IWB use, in attempting to understand the use and affordances of IWB use. Considering the sort of multimedia content being used by teachers in the sample, and how it is being organised, may provide useful insight into how this multimedia environment is being used. This CA, therefore, will investigate some aspects of how the teachers in the sample are using multimedia in IWB presentations in their lessons.

The size of this study is such that interpretations relating to the data of the study cannot be assumed to apply to IWB use more generally. However, it is certainly possible to see whether there are patterns of use that are being established in the sample schools, patterns which may be deserving of further investigation.

5.2 Terminology

The term 'content' refers to the texts that were shown and broadcast, using the IWB, during the observed lessons. Texts, in the context of this method, refers to both visual or sound resources used on the IWB. This includes a wide range of material, from videos to PowerPoints to webpages. One text used on the IWB refers to the smallest unit or showing of something shown on the IWB. It can be summed up as one screen's-worth of content used within the lesson, for example one page from an electronic flipchart or one PowerPoint slide. In the case of a video, it refers to one showing from start to finish. It is important to note that within the data collected, there is no indication of the length of time a text is displayed. The intention here, is
not to consider the individual contribution of one text, or to provide a detailed insight into an isolated text, but rather to consider the texts more broadly, in terms of how the teachers in the study use different kinds of text on an IWB to contribute to the teaching of English, and how they manipulate the content of the IWB in order to facilitate this teaching.

5.3 The creator of the resource

5.3.1 Overview

IWBs allow access to a wide range of resources for classroom use. By considering the creator of the resource, this method seeks to gain insight into how teachers secure resources for the IWB. This study looks for whether the sample teachers use teacher-created resources or commercially produced resources, and whether pupils create resources. There are implications within the choice of resource, particularly with regard to the flexibility and accessibility of resources. Findings on the origin of IWB resources may shed light on the decisions that English teachers are taking with regard to the embedding of this digital technology and to any possible changing role of the teacher in the classroom in relation to the kinds of resources used in English teaching.

5.3.2 Teacher-created resources

Within this study teachers were the main creators of IWB content, creating nearly 50% of the resources (Figure 5.1). A teacher-created resource refers to one designed and created, in a non-commercial sense, by a teacher at the case study school, or any other school. The defining feature is that the resource is not produced in a commercial environment for publication and sale by a publisher. This inclination for teachers to create resources for use on the IWB echoes the findings of Moss et al. (2007) who note the tendency for teachers to create their own resources.
However the overall percentage of teacher-created resources perhaps masks the teacher preferences. Five of the seven teachers used mainly teacher-created resources within the fourteen lessons analysed. In nine of these lessons, teacher-created lessons were used almost exclusively, with perhaps only one resource that was created by pupils or commercially produced. Only one teacher, Bryn, made no use of teacher-created resources. Three of the four schools used mainly teacher-created resources on the IWB. The proportions used in each of these three schools were high: Amberton 83%, Casland 97%, Doversford 92%. Only Brightley differed by having commercially-produced resources at 34%, pupil-created resources at 51% and teacher-created resources at only 16%. Within this study, therefore, the IWB was used very much a teaching tool in the domain of the teacher, using resources created by the teacher.

5.3.3 Commercially-produced resources
Commercially-produced resources refers to any resources created by an external publisher. They accounted for just under one quarter of the IWB content overall (Figure 5.1). Some use of commercially-produced content was found in three out of four schools, but they were mainly used by two teachers from the same school: Bill and Bryn from Brightley School where the content came from two publishers (Daydream Education and Boardworks) purchased by the school and available on the school network. The software provides resources on various English topics and
authors. The typical format of both packages was screens with explanations, descriptions and examples (for example, describing and exemplifying a sonnet) followed by a game or exercise to test the pupils’ understanding of the topic. Within one package the screens of information are bright and colourful, with texts in colour-filled boxes and some use of cartoon-like images used as illustration. The other package was less colourful and did not include any images. In both cases, the games were very simple in nature (e.g. cloze exercise, multiple choice question) and easily achievable in a traditional format (e.g. worksheet). This following of traditional pedagogy echoes the finding of Moss et al. that 'IWBs were primarily being used to support existing pedagogy' (2007, p.23). However, the use of the software package facilitates resource management by holding the resources in one location. The main disadvantage to the teacher in using commercially produced packages is the inclusion of extraneous material, not pertinent to the learning objective of that lesson and so which needs to be passed over.

The commercial packages observed in this study, in the main, supported traditional teaching methods. The one exception, perhaps, is Abigail’s use of the Wallwisher (now known as Padlet) application. This online application, allows pupils to place a note on a virtual pinboard (Figure 5.2). The notes are limited to 160 characters, and so the writer must be concise. Abigail asked her pupils to leave a note on the 'wall' about how the story being read could be improved, so pupils can look at the views of the others and write their own. Their comments were being written as part of a community of readers, where views were being expressed, shared and built in a collaborative way. This is a significantly different approach to the traditional homework where pupils write independently and their views are mainly for the benefit of the teacher.
5.3.4 Pupil-created resources

Twenty-eight percent of the resource counts were attributed to pupils. However, much of this is accounted for by one year 11 lesson (taught by Bryn at Brightley School) where pupils were giving presentations, and relied heavily on using many PowerPoint slides to guide their presentations. There were fifty-five counts for pupil-created resources in this lesson, from a total of fifty-seven counts of pupil-created resources overall (Table 5.1). So the majority of counts of pupil-created resources were from one lesson. Pupil-created resources were used by three teachers, in three lessons. Within two of these lessons there was only one count of a pupil-created resource. Therefore, with the exception of one lesson where students were giving presentations, pupil-created resources were rarely used. It is important to acknowledge the data from the lesson with many counts of pupil-created resources but also to avoid emphasising the import of the data, as it is clear that pupil-created resources are not widely used in most teachers' lessons in the sample schools. Indeed, within the lessons observed, the IWB was a tool for presenting teaching resources, rather than displaying or sharing pupil materials.
5.3.5 Summary of resource creator

Teacher-created resources were the most counted resources with the teachers in this sample. Commercially-produced resources were evident but accounted for less than a quarter of the total counts made in all schools. In six of the fourteen lessons analysed, there was no use of commercially-produced resources. Overall, within the lessons observed, commercially-produced resources were not in great evidence. Whilst the percentage of counts of pupil-created resources was higher than commercially produced resources, the spread was not so great, with evidence of pupil-created resources in only three lessons. In the main, the teachers observed in this study used teacher-created resources. One implication of this approach is that IWB use is making substantial demands on the teachers’ time in terms of creating IWB resources.

<table>
<thead>
<tr>
<th>School</th>
<th>Teacher</th>
<th>Lesson</th>
<th>Resource Creator (no. of counts)</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Commercial</td>
<td>Teacher</td>
</tr>
<tr>
<td>Amberton</td>
<td>Abigail</td>
<td>1</td>
<td>6</td>
<td>14</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2</td>
<td>0</td>
<td>7</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3</td>
<td>1</td>
<td>11</td>
</tr>
<tr>
<td></td>
<td>Alice</td>
<td>5</td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>6</td>
<td>0</td>
<td>7</td>
</tr>
<tr>
<td>Brightley</td>
<td>Beverley</td>
<td>7</td>
<td>1</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td></td>
<td>8</td>
<td>0</td>
<td>7</td>
</tr>
<tr>
<td></td>
<td>Bill</td>
<td>9</td>
<td>16</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Bryn</td>
<td>10</td>
<td>12</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>11</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>12</td>
<td>8</td>
<td>0</td>
</tr>
<tr>
<td>Casland</td>
<td>Cherry</td>
<td>13</td>
<td>0</td>
<td>15</td>
</tr>
<tr>
<td></td>
<td></td>
<td>15</td>
<td>0</td>
<td>13</td>
</tr>
<tr>
<td>Doversford</td>
<td>Deborah</td>
<td>16</td>
<td>1</td>
<td>11</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>46</td>
<td>100</td>
<td>57</td>
</tr>
</tbody>
</table>

Table 5.1: The number of counts indicating Resource Creators for schools and teachers
Another implication relates to resources design. Teachers may be designing their own resources on the IWB to address the needs of a particular scheme of work and/or class in a way that it is not possible with many commercial resources, although this may also have implications in terms of the clarity and accessibility of such resources. The next part of the content analysis looks at some of the choices that are being made in terms of resource design.

5.4 The nature and composition of the resources

As well as providing data on the creators of the resources, the CA also sets out to provide data on the nature of the resources used on the IWB by the observed teachers, namely:

- the types of resources used
- analysis of some of the compositional elements of the resources
- aspects related to the delivery of the resources.

5.4.1 Types of resource

Ten types of resource were observed in this study (Table 5.2). The two main types are: PowerPoint and electronic notebooks/flipcharts (ENF). ENF refers to two separate programs (see Chapter 2.4.2) which perform similar functions and share many of the same features. These are followed by name chooser (random name selector), games and specialist programs.

PowerPoint is the most counted resource with 107 counts. As has been noted in section 5.3.4, fifty-five of these counts (just over 50%) are from one lesson. It is uncertain how representative this is of typical practice, and the figures should be regarded with caution. (If the counts from this one lesson are left out, the figures for ENF and PowerPoint are far closer together.) What is clear, however, is that there are far many more counts of ENF and PowerPoint than other types of resources; together they account for nearly 82% of all the resource counts. These programs are the most commonly used by the teachers and all the observed teachers used one of these programmes (Table 5.3).
<table>
<thead>
<tr>
<th>Resource type</th>
<th>No. of counts</th>
<th>Percentage (of total no. of counts)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electronic notebook/flipchart (ENF)</td>
<td>59</td>
<td>29.1</td>
</tr>
<tr>
<td>PowerPoint</td>
<td>107</td>
<td>52.7</td>
</tr>
<tr>
<td>Word document</td>
<td>1</td>
<td>0.5</td>
</tr>
<tr>
<td>English specialist program</td>
<td>7</td>
<td>3.4</td>
</tr>
<tr>
<td>Games</td>
<td>9</td>
<td>4.4</td>
</tr>
<tr>
<td>DVD video</td>
<td>3</td>
<td>1.5</td>
</tr>
<tr>
<td>Internet pages</td>
<td>2</td>
<td>1.0</td>
</tr>
<tr>
<td>Timer</td>
<td>3</td>
<td>1.5</td>
</tr>
<tr>
<td>Name chooser</td>
<td>11</td>
<td>5.4</td>
</tr>
<tr>
<td>Register</td>
<td>1</td>
<td>0.5</td>
</tr>
<tr>
<td>TOTAL</td>
<td>203</td>
<td>100</td>
</tr>
</tbody>
</table>

Table 5.2: Resource types used in observed lessons (no. of counts/percentages)

<table>
<thead>
<tr>
<th>Resource type</th>
<th>Abigail</th>
<th>Alice</th>
<th>Beverley</th>
<th>Bill</th>
<th>Bryn</th>
<th>Cherry</th>
<th>Deborah</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electronic notebook/flipchart (ENF)</td>
<td>31</td>
<td>12</td>
<td>0</td>
<td>4</td>
<td>0</td>
<td>1</td>
<td>11</td>
<td>59</td>
</tr>
<tr>
<td>PowerPoint</td>
<td>0</td>
<td>0</td>
<td>12</td>
<td>0</td>
<td>67</td>
<td>28</td>
<td>0</td>
<td>107</td>
</tr>
<tr>
<td>Word document</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>English specialist program</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>7</td>
</tr>
<tr>
<td>Games</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>7</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>9</td>
</tr>
<tr>
<td>DVD video</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Internet pages</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>Timer</td>
<td>2</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>Name chooser</td>
<td>5</td>
<td>0</td>
<td>0</td>
<td>6</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>11</td>
</tr>
<tr>
<td>Register</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>TOTAL</td>
<td>40</td>
<td>13</td>
<td>14</td>
<td>20</td>
<td>75</td>
<td>29</td>
<td>12</td>
<td>203</td>
</tr>
</tbody>
</table>

Table 5.3: The number of counts of resource type used by each teacher
Teachers appear to have an inclination for either ENF or PowerPoint. In nearly all cases, they used one and not the other. The one teacher who was observed to use both - Cherry - has twenty-eight counts of PowerPoint and only one of ENF, demonstrating a pronounced use of one application above the other. In nearly all cases, the use of ENF or PowerPoint far outweighed the use of other resources. Bill is the exception to this, as he made use of a range of resource types (games, name chooser, ENF, specialist program) with no one resource heavily predominating. Of the other main five resources noted (games, name chooser, specialist program), each was used by only two teachers. The maximum number of types of resource used by any one teacher was five. The average (mean) number of types of resources used by the teachers is three. This seems to reflect quite a limited range of resources are being used on IWBs by the teachers, possibly suggesting that teachers develop definite preferences in their deployment of resources.

5.4.2 Compositional elements

With nearly half of all the resources observed being created by teachers themselves (Table 5.1), the design of IWB resources has become a significant task for teachers. Moss et al. assert that 'many teachers struggle to incorporate principles of design which can establish clear reading paths for pupils' (2007, p. 5). This may be due to the digital capabilities of IWBs which require a consideration of the multimedia nature of IWB resources. The CA considered design features relating to colour, images and sound. These were chosen as being features that mark differences in use from traditional whiteboards.

Colour in written text

This variable explores whether teachers use colour in written text within IWB resources. Data has been gathered on whether written text and its background are in black and white or colour, or a mixture of both. Overall, colour is a significant element of design, occurring in 69% of all the counts relating to written texts, either in the written text itself or in the background. ENF resources are more likely to include colour in written text and background than PowerPoint (Table 5.4). Colour was used in the written text or background to the text in 73% of ENF counts, compared with 59% of counts of PowerPoint resources. Black and white text features prominently, appearing
in 41% of PowerPoint resources and representing 22% of counts from all resources. Of the three teachers who make substantial use of PowerPoint - Beverley, Bryn and Cherry – two have contrasting approaches to the incorporation of colour in written text (Table 5.5). Beverley predominantly used black and white in her slides. Cherry, on the other hand, always used colour in the written aspect of her PowerPoints and never uses just black and white. Black and white and colour are evenly balanced in Bryn’s PowerPoint content, although the majority of his PowerPoint content was designed by pupils. Overall, colour relating to written text is a significant design element. It is more likely to occur in an ENF resource, within this sample of lessons. However, black and white written resources maintain a substantial presence.

<table>
<thead>
<tr>
<th>Resource type</th>
<th>Counts of colour relating to written text (Percentage within resource given in brackets)</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Black &amp; white only</td>
<td>Some/all coloured text</td>
</tr>
<tr>
<td>ENF</td>
<td>16 (21.1%)</td>
<td>15 (25.4%)</td>
</tr>
<tr>
<td>PowerPoint</td>
<td>41 (40.6%)</td>
<td>19 (18.8%)</td>
</tr>
<tr>
<td>Total</td>
<td>57</td>
<td>34</td>
</tr>
</tbody>
</table>

Table 5.4: The number of counts relating to colour in written text in ENF and PowerPoint resources

<table>
<thead>
<tr>
<th>Teacher</th>
<th>Counts of colour relating to written text in teachers using mainly PowerPoint</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Black &amp; white only</td>
</tr>
<tr>
<td>Beverley</td>
<td>10</td>
</tr>
<tr>
<td>Bryn</td>
<td>31</td>
</tr>
<tr>
<td>Cherry</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td>41</td>
</tr>
</tbody>
</table>

Table 5.5: Counts of colour in written text in the content of teachers using predominantly PowerPoint.
**Colour in non-written text**

CA was used to consider the use of colour in non-written elements of the IWB content, for example in images, video and animations (Table 5.6). Colour content occurs in seven of the ten types of resource observed on the IWBs, including all counts relating to the Internet and video content. The proportion of counts indicating colour elements used is very similar for ENF (58%) and PowerPoint (56%). Colour elements, therefore, appear to be a significant feature of the design of IWB content, whether the teacher uses ENF or PowerPoint resources.

<table>
<thead>
<tr>
<th>Resource type</th>
<th>The no. of counts indicating colour in non-written content (Percentage within resource given in brackets)</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Colour elements present</td>
<td>Black and white elements present</td>
</tr>
<tr>
<td>----------------------------</td>
<td>-------------------------</td>
<td>---------------------------------</td>
</tr>
<tr>
<td>ENF</td>
<td>34 (57.6%)</td>
<td>25 (42.4%)</td>
</tr>
<tr>
<td>PowerPoint</td>
<td>60 (56.1%)</td>
<td>47 (43.9%)</td>
</tr>
<tr>
<td>Word document</td>
<td>0 (0%)</td>
<td>1 (100%)</td>
</tr>
<tr>
<td>English specialist program</td>
<td>3 (42.9%)</td>
<td>4 (57.1%)</td>
</tr>
<tr>
<td>Games</td>
<td>6 (66.7%)</td>
<td>3 (33.3%)</td>
</tr>
<tr>
<td>DVD video</td>
<td>3 (100%)</td>
<td>0 (0%)</td>
</tr>
<tr>
<td>Internet pages</td>
<td>2 (100%)</td>
<td>0 (0%)</td>
</tr>
<tr>
<td>Timer</td>
<td>0 (0%)</td>
<td>3 (100%)</td>
</tr>
<tr>
<td>Name chooser</td>
<td>5 (45/5%)</td>
<td>6 (54.5%)</td>
</tr>
<tr>
<td>Register</td>
<td>0 (0%)</td>
<td>1 (100%)</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>111</strong></td>
<td><strong>92</strong></td>
</tr>
</tbody>
</table>

Table 5.6: Counts of colour in non-written content
**Still images**
Still images were commonly evidenced in IWB resources, being noted in over half of the counts of ENF resources (53%) and in 59% of PowerPoint presentations (Table 5.7). They are used in specialist programs (43% of counts) and in games (78%). In terms of the creator of the resources, still images were most likely to be used by pupils (75% of counts), followed by teachers (51%) and commercial producers (26%) (Table 5.8). Still images were noted in the majority of counts for five out of seven teachers. It would seem, therefore, that still images are generally considered an important design elements in using resources on the IWB.

<table>
<thead>
<tr>
<th>Resource type</th>
<th>The no. of counts of still images (Percentage within resource given in brackets)</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Still image</td>
<td>No still image</td>
</tr>
<tr>
<td>ENF</td>
<td>31 (52.5%)</td>
<td>28 (47.5%)</td>
</tr>
<tr>
<td>PowerPoint</td>
<td>63 (58.9%)</td>
<td>44 (41.1%)</td>
</tr>
<tr>
<td>Word document</td>
<td>0 (0%)</td>
<td>1 (100%)</td>
</tr>
<tr>
<td>English specialist program</td>
<td>3 (42.9%)</td>
<td>4 (57.1%)</td>
</tr>
<tr>
<td>Games</td>
<td>7 (77.8%)</td>
<td>2 (22.2%)</td>
</tr>
<tr>
<td>DVD video</td>
<td>0 (0%)</td>
<td>3 (100%)</td>
</tr>
<tr>
<td>Internet pages</td>
<td>2 (100%)</td>
<td>0 (0%)</td>
</tr>
<tr>
<td>Timer</td>
<td>0 (0%)</td>
<td>3 (100%)</td>
</tr>
<tr>
<td>Name chooser</td>
<td>0 (0%)</td>
<td>11 (100%)</td>
</tr>
<tr>
<td>Register</td>
<td>0 (0%)</td>
<td>1 (100%)</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>106</td>
<td>97</td>
</tr>
</tbody>
</table>

Table 5.7: The number of counts of still images used within resources
<table>
<thead>
<tr>
<th>Resource creator</th>
<th>The no. of counts of still images (Percentage for each resource creator given in brackets)</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Still image</td>
<td>No still image</td>
</tr>
<tr>
<td>Commercial producer</td>
<td>12 (26.1%)</td>
<td>34 (73.9%)</td>
</tr>
<tr>
<td>Teacher</td>
<td>51 (51%)</td>
<td>49 (49%)</td>
</tr>
<tr>
<td>Pupil</td>
<td>43 (75.4%)</td>
<td>14 (24.6%)</td>
</tr>
<tr>
<td>Total</td>
<td>106</td>
<td>97</td>
</tr>
</tbody>
</table>

Table 5.8: The counts of still images according to resource creator

Moving images and animation
There were only three counts of moving images or videos in the IWB content analysed. However, as has already been noted, this does not indicate the length of the video, merely that three sections of video were shown. These videos were used by three different teachers. All of the video observed was created by commercial producers and the videos were all in colour. Two were extracts from longer films and one a self-contained short video. There was no annotation of the videos.

Animation here describes the manipulation of still images and objects to provide the impression of movement, such as animated clipart or animated elements of a PowerPoint slide. It is an eye-catching feature, designed to attract attention. Animation does appear within the observed lessons, although its use is quite limited (Table 5.9). The most counts of animation were for ENF resources (10 counts) usually in the form of animated clip art. There were no counts for PowerPoint which is intriguing as animation is a particular feature of the PowerPoint program. Commercial producers were the creators who included animation most often, with animation being used in 37% of the counts of commercially-produced resources, compared with 10% of teacher-produced resources (Table 5.10). There were no counts of animation in the pupil-produced resources.
<table>
<thead>
<tr>
<th>Resource type</th>
<th>The no. of counts of animation used in resources (Percentage within resource given in brackets)</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Animation present</td>
<td>No animation present</td>
</tr>
<tr>
<td>ENF</td>
<td>10 (16.9%)</td>
<td>49 (83.1%)</td>
</tr>
<tr>
<td>PowerPoint</td>
<td>0 (0%)</td>
<td>107 (100%)</td>
</tr>
<tr>
<td>Word document</td>
<td>0 (0%)</td>
<td>1 (100%)</td>
</tr>
<tr>
<td>English specialist program</td>
<td>3 (42.9%)</td>
<td>4 (57.1%)</td>
</tr>
<tr>
<td>Games</td>
<td>7 (77.8%)</td>
<td>2 (22.2%)</td>
</tr>
<tr>
<td>DVD video</td>
<td>0 (0%)</td>
<td>3 (100%)</td>
</tr>
<tr>
<td>Internet pages</td>
<td>0 (0%)</td>
<td>2 (100%)</td>
</tr>
<tr>
<td>Timer</td>
<td>2 (66.7%)</td>
<td>1 (33.3%)</td>
</tr>
<tr>
<td>Name chooser</td>
<td>5 (45.5%)</td>
<td>6 (54.5%)</td>
</tr>
<tr>
<td>Register</td>
<td>0 (0%)</td>
<td>1 (100%)</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>27</strong></td>
<td><strong>176</strong></td>
</tr>
</tbody>
</table>

Table 5.9: The number of counts of animation in resources

<table>
<thead>
<tr>
<th>Resource creator</th>
<th>The no. of counts of animation (Percentage for each resource creator given in brackets)</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Animation present</td>
<td>No animation present</td>
</tr>
<tr>
<td>Commercial producer</td>
<td>17 (37%)</td>
<td>29 (63%)</td>
</tr>
<tr>
<td>Teacher</td>
<td>10 (10%)</td>
<td>90 (90%)</td>
</tr>
<tr>
<td>Pupil</td>
<td>0 (0%)</td>
<td>57 (100%)</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>27</strong></td>
<td><strong>176</strong></td>
</tr>
</tbody>
</table>

Table 5.10: The number of counts of animation for each resource creator
**Audio**

The CA looked for the inclusion of audio within resources, distinguishing between spoken voice audio and music/sounds/sound audio. No evidence of voice audio was found. A limited number of counts (10) were made of audio that was music/sound (Table 5.11), all within commercially-produced resources. Audio was not a widely used feature by the English teachers in this study and would appear to be an under-utilised aspect of the multimedia potential of IWBs.

<table>
<thead>
<tr>
<th>Resource creator</th>
<th>The no. of counts of audio (music/sounds). (Percentage for each resource creator given in brackets)</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Audio</td>
<td>No audio</td>
</tr>
<tr>
<td>Commercial producer</td>
<td>10 (21.7%)</td>
<td>36 (78.3%)</td>
</tr>
<tr>
<td>Teacher</td>
<td>0 (0%)</td>
<td>100 (100%)</td>
</tr>
<tr>
<td>Pupil</td>
<td>0 (0%)</td>
<td>57 (100%)</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 5.11: The number of counts for audio (music/sounds) for each type of creator

**5.4.3 Delivery aspects**

Closely related to matters of design, are features of *delivery*. Delivery here refers to issues specific to content, including the type of written text used, whether annotation is used and whether texts are modified or repeatedly used. Gaining insight into how English content is delivered via an IWB is an important thread in this study.

**Written text**

IWBs allow the use of both handwritten text and typed text. The CA examined whether the main text on a screen was largely typed/printed or handwritten text (Table 5.12). (This variable focused upon texts written as complete or independent texts, and not at written text used as annotation of other texts). There were only nine counts (5%) of handwritten text, against 184 (95%) of printed text, indicating a strong preference for printed text. The maximum number of counts of handwritten text for one teacher (Deborah) with four; there was no handwritten text evidenced from three teachers (Table 5.12).
Within this study, handwriting is associated with ENF use. There are no examples of handwritten text being used with PowerPoint. ENF programs provide special pen functions. The same is not true for PowerPoint where slides are designed for printed text. An implication from this finding is that teachers who do not use ENF are reducing their multimedia options and possibly reducing the flexibility of the IWB as a teaching and learning tool. Handwritten notes may be appropriate in more spontaneous teaching situations, responding to pupils' queries, for example. The types of software teachers chose to use may, therefore, have implications for the flexibility of their practice in using the IWB.

**Annotation**
The use of annotation was also analysed (Table 5.12). Annotation, in this context, refers to the addition of handwritten notes, highlighting or symbols (usually brief) to an existing text, an image or poem, for example. So it does not refer to the creation of a text from scratch. Annotation can provide opportunities for, amongst other things, direct interaction and engagement with texts, joint or public reflection on texts and modelling of responses so it is potentially a supportive strategy. Overall, there were twenty-five counts of annotation, two-thirds of which were on ENFs and one-third on PowerPoint slides (Figure 5.3). This number of counts accounts for 29% of the all the

<table>
<thead>
<tr>
<th>Teacher</th>
<th>Written text</th>
<th>Annotation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Printed</td>
<td>Handwritten</td>
</tr>
<tr>
<td>Abigail</td>
<td>36</td>
<td>3</td>
</tr>
<tr>
<td>Alice</td>
<td>13</td>
<td>0</td>
</tr>
<tr>
<td>Beverley</td>
<td>12</td>
<td>1</td>
</tr>
<tr>
<td>Bill</td>
<td>20</td>
<td>0</td>
</tr>
<tr>
<td>Bryn</td>
<td>69</td>
<td>0</td>
</tr>
<tr>
<td>Cherry</td>
<td>27</td>
<td>1</td>
</tr>
<tr>
<td>Deborah</td>
<td>7</td>
<td>4</td>
</tr>
<tr>
<td>TOTAL</td>
<td>184</td>
<td>9</td>
</tr>
</tbody>
</table>

Table 5.12: The counts of written text and annotated text for each teacher
ENF counts and only 8% of the PowerPoint counts. Again, it may be that PowerPoint is associated, by the teachers in the sample, with a lack of flexibility in the presentation and consideration of resources in class.

Annotation was present in the content of all the teachers, although it appears to be an occasional feature (Table 5.12). Abigail used annotation most often (fourteen counts), followed by Cherry (four) and the remaining teachers have only one or two counts. Annotation was not widely used. As has been noted above, handwritten text was not extensively used. This may relate to issues of preparation (particularly when being observed), or perhaps ease or neatness of writing.

![Figure 5.3: The percentage of ‘annotation’ counts on ENF and PowerPoint resources](image)

**Repetition and modification**

Two further areas relating to the delivery of resources investigated were whether the teachers:

a) re-presented slides or screens - to either review, remind or perhaps rework information with pupils?

b) re-presented the slide or screen and then modify the resources used, by adding annotation for example?

Repeating, reviewing and possibly annotating a screen of information viewed earlier in a lesson, for example, may support reflection on a topic or on the progression of learning. Logistically, it may also cut down on the amount of preparation needed for resource creation, and be seen as teachers exploiting resources to the full.
CA revealed some revisiting of resources in this way (Table 5.13); 86% of resources shown are new to the pupils, with 14% being used again, later in the same lesson. Similarly, the analysis looked at whether slides or screens were modified in any way, for example by annotation, but this occurred in only 1% of the counts. So the same material may be shown again, but there is rarely any change to the content of the slide. Pedagogically and logistically, these may be areas worth further consideration by teachers.

<table>
<thead>
<tr>
<th>Resource type</th>
<th>Total counts for the resource</th>
<th>Repeated</th>
<th>Modified</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electronic notebook/Flipchart</td>
<td>59</td>
<td>15 (7.4%)</td>
<td>2 (1%)</td>
</tr>
<tr>
<td>PowerPoint</td>
<td>107</td>
<td>9 (4.4%)</td>
<td>0</td>
</tr>
<tr>
<td>Word document</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>English specialist program</td>
<td>7</td>
<td>1 (0.5%)</td>
<td>0</td>
</tr>
<tr>
<td>Games</td>
<td>9</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>DVD video</td>
<td>3</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Internet pages</td>
<td>2</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Timer</td>
<td>3</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Name chooser</td>
<td>11</td>
<td>4 (2%)</td>
<td>0</td>
</tr>
<tr>
<td>Register</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td><strong>Totals</strong></td>
<td><strong>203</strong></td>
<td><strong>29 (14.3%)</strong></td>
<td><strong>2 (1%)</strong></td>
</tr>
</tbody>
</table>

Table 5.13: The number of counts (and percentages) of resources that were repeated or modified

### 5.4.4 Summary of the nature and composition of the resources

The resources that appear to be most well used with the sample of English teachers are PowerPoint and ENF. Noticeably teachers appear to opt for one of these programs and use it to the exclusion of the other. Only one teacher, Cherry, used both during the observations and she used one far more than the other. The chosen program becomes the mainstay of their use of the IWB. This 'either/or' situation is significant. PowerPoint and ENF are essentially different types of program. They are both concerned with presentation but they operate differently and therefore have distinct
affordances. PowerPoint creates slide shows; the content of these slide shows moves forward in a linear manner. ENFs, on the other hand, provide an electronic notebook or flipchart in which progression is not necessarily linear. Rather, the user chooses how to navigate through the presentation. By becoming exclusive in their practice, the teachers may be reducing the multimedia affordances of the IWB.

An essential difference between the two programmes centres on the use of one of the IWB’s accessories: the pen or stylus which enables the user to write on the board. PowerPoint slide shows can be advanced by the use of the pen/stylus when it operates as a 'mouse' and 'clicks' the slide show onwards, or by mouse or keyboard. The ENF, on the other hand, presents itself as a blank page and, as such, is more conducive to writing. ENF programs incorporate 'pens' and 'highlighters', and they enable handwriting to be transformed to printed text. PowerPoint does not have this emphasis on writing and annotation. Over two-thirds of the annotation observed was on ENF content rather than PowerPoint (Figure 5.3). Whilst annotation may be associated with traditional static whiteboards, it may accompany important pedagogical processes such joint collaboration, modelling, text analysis, etc. A lack of annotation may, therefore, represent a reduction of pedagogic capability on the part of PowerPoint users.

Factors leading to a limited repertoire of types of resource on the IWB may include lack of exposure to resources, financial limitations (for example, due to lack of funds for purchasing resources), lack of initial training with a resource or lack of time to develop competence. Teachers may also develop early familiarity and competence in one program and find it more manageable to remain with it.

Within the resources they are creating, the teachers in the sample are making design decisions. For example, there is a conscious use of colour within text or background. Figure 5.4, for example, shows a screen from one of Abigail's ENF resources. The layout of the text is carefully arranged on the page to help students navigate through it, including underlined text, numbered points, italicised text and coloured text. The key piece of information – the ‘rubric’ - is in red font, (reflecting the original meaning
of 'rubric' where the key information was written in red). Similarly Figure 5.5, a slide from a PowerPoint by Cherry, demonstrates how she uses coloured backgrounds to distinguish between the blocks of text on the structure and history of limericks. Again, she is designing the slide to help pupils read the different parts of the text. These teachers are making deliberate decisions on the design of the content in order to help pupils navigate IWB content. In terms of the CTML (see Chapter 1.5), where Mayer (2005) asserts that active processing of information is needed, the teachers are assisting with the selection and organisation of the information.

![Figure 5.4: Use of coloured text to highlight key information](image1)

![Figure 5.5: The use of colour for text background](image2)
Most of the teachers in the sample appear to have developed a particular approach to colour and written text. Beverley and Deborah, for example, use only black and white for most of their written content. Alice, Bill and Cherry usually use coloured elements in their written content. The differences in usages are quite clear-cut and indicate definite decisions being made about the design of the content.

The CA also considers the use of still images which form a significant element of IWB content in this study. After written text (with 193 counts), it is the most commonly used element examined, with 106 counts. In terms of resource creator, still images are present in three-quarters of pupils' counts, about half of teachers' counts and nearly a quarter of commercially produced resources. All of the teachers used still images, although Beverley and Deborah only had two counts each. With many of the resources used on the IWB, still images were an intrinsic part of the design.

Still images were used in different ways. The pupils used them to illustrate the topic of their presentations and the images would often be large and dominate the presentation (Figure 5.6). Teachers also sometimes use them to illustrate and adorn presentations but in a less conspicuous manner. A more subtle use by some teachers was to employ images to create a house-style for their presentations, whereby still images (as well as animations and font style) create a recognisable pattern to the lesson presentation. For example, Abigail used an image of an eye next to the objective she was looking for in a lesson (Figure 5.7). Other teachers created a house-style of presentation throughout the resource for a unit of work. Figure 5.8 shows the use of images to provide a framework for pupils' responses. A similar use was providing an image of a wall on which pupils placed sticky notes with responses on. Figure 5.9 shows an example of a teacher providing a picture to give students a model of how to respond to a task (writing a significant line of poetry on their arm). Finally, Figure 5.10 shows how a teacher used still images to show examples of the portrayal of a character, which were then compared.
Figure 5.6: Pupil’s use of still images

Figure 5.7: Use of image as part of a house-style

Figure 5.8: Using images to provide a framework for responses
Moving images, or video, were used in three lessons. In two cases, the film was a planned, intrinsic part of what was being studied in the lesson. In both cases, the video was shown without pause. In the third case, a video was used spontaneously to illustrate an aspect of historical context in the text being studied. The video was frozen and played back to illustrate the point being made. In all three cases, the IWB was used to broadcast the video, but there was no use of other IWB features such as annotation.
There were also few counts of audio resources. There were two values for audio: spoken word and music/sound. There was no evidence of spoken word audio in this study. Indeed, within teacher-created resources there were no examples of audio elements at all, which may indicate that the sample teachers do not see the IWB as a means of using audio or it may perhaps reflect a lack of audio resources in their general practice.

As well as noting aspects of content composition, the CA also considered some features of delivery including how written text is presented and the presence of annotation and modification. A notable feature is that the written text seen in this study was mainly typed/printed. This is a major change in practice for teachers (compared with traditional blackboards and static whiteboards). This may be due to a desire to present writing clearly, professionally and efficiently (as printed text is usually more compact than handwriting). It may also be a response to a lack of fluency and precision with the IWB pen/stylus as writing on an IWB. Examples from three teachers in this study (Figure 5.11) show letters are often 'printed' rather than joined up and the pen-line appears rather thick.

Figure 5.11: Examples of handwriting from three teachers
The relative lack of fluency in writing, compared with a traditional whiteboard, may also account for the limited annotation noted in this study. Only one teacher from the seven had more than four counts of annotation (Table 5.12). There was also a lack of modification in resources. Being a digital technology, the IWB should facilitate reworking and annotation of texts. Low incidences of annotation and modification may indicate that this potential of the IWB is being underutilised. The lack of modification, in particular, may signify that sample teachers see the IWB as a tool for merely presenting information, and that opportunities to jointly engage with, manipulate and explore resources are not being used.

In terms of the resource creator, certain patterns have emerged. Commercial producers are distinguished by such aspects as high use of printed text, and wide use of colour in the written text and background for written text. They are also more likely than other resource creators to include animation and audio. Teachers also make extensive use of printed written text and colour in the written text and background, and they make significant use of still images. Pupils make high use of still images and colour in non-written elements of the content. However they are more likely to use black and white written text and background. Overall, there is a limited use of multimedia features such as audio, moving image and annotation. The overriding type of content used is written text followed by still images. In terms of CTML (see Chapter 1.5) these are both processed by the learner's visual/pictorial channel. The IWB is not making much use of the auditory channel. Of course, the teacher operating the IWB is usually a source of auditory information for the learner. The successful integration of teacher and IWB, terms of the CTML, is an important consideration, although beyond the scope of this study.

5.5 The pedagogic focus of the resources

Finally, the CA focuses on the pedagogic attention of the IWB content. Two main aspects are considered here:
a) the stage of instruction addressed by the resource  
b) the English subject focus of the resource.

The focuses here are to consider at what stage in the teaching and learning process the teacher uses the IWB and for what aspects of English subject content.

5.5.1 Stages of instruction

The CA seeks to gain insight into when the sample teachers used an IWB within the teaching and learning process. By considering whether different types of resource are used at particular stages of learning, it should hopefully not only illuminate current practice within this sample but also stimulate thought and ideas on the potential and capabilities for IWB to support various stages of teaching and learning.

A variable was created to provide a broad indication of the stage in the teaching process that is addressed by any IWB use: the ‘stage of instruction’ variable. This variable was derived from the nine instructional events devised by Gagne (1985) as part of his Conditions of Learning theory (see Chapter 3.8.2). The stages used are reiterated in Table 5.14.

<table>
<thead>
<tr>
<th>Stages used in this study</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gaining attention</td>
</tr>
<tr>
<td>Identifying objectives</td>
</tr>
<tr>
<td>Recalling prior learning</td>
</tr>
<tr>
<td>Presenting stimulus</td>
</tr>
<tr>
<td>Guiding learning</td>
</tr>
<tr>
<td>Eliciting performance</td>
</tr>
<tr>
<td>Reviewing/plenary</td>
</tr>
<tr>
<td>Feedback/assessment</td>
</tr>
</tbody>
</table>

Table 5.14: The stages of instruction used in this study

*Eliciting performance* (68 counts) was the single most counted stage of instruction, accounting for 33.5% of the total number of counts (Table 5.15). The next most common value was *guiding learning* (41 counts) and then *presenting stimulus* (35...
counts). The least number of counts were for reviewing/plenary (7 counts) and recalling prior learning (6 counts). All of the stages of instruction are counted at some point within the observed lessons apart from feedback/assessment where there were no counts.

When considering the main types of resource (ENF and PowerPoint) used at the different stages of study, they both have substantial counts for guiding learning and eliciting performance but they also differ in use with PowerPoint gaining more counts for presenting stimulus and ENF having a greater proportion of counts for reviewing/plenary.

<table>
<thead>
<tr>
<th>Resource type</th>
<th>The no. of counts for each stage of instruction against each type of resource (Percentage within resource given in brackets)</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENF</td>
<td>1 (1.7%) 7 (11.9%) 2 (3.4%) 6 (10.2%) 24 (40.7%) 11 (18.6%) 8 (13.6%) 0 (0%)</td>
<td>59 (100%)</td>
</tr>
<tr>
<td>PowerPoint</td>
<td>3 (2.8%) 6 (5.6%) 4 (3.7%) 19 (17.8%) 13 (12.1%) 56 (52.3%) 6 (5.6%) 0 (0%)</td>
<td>107 (100%)</td>
</tr>
<tr>
<td>Word document</td>
<td>0 (0%) 0 (0%) 0 (0%) 0 (0%) 0 (0%) 0 (0%) 0 (0%) 0 (0%)</td>
<td>1 (100%)</td>
</tr>
<tr>
<td>English specialist program</td>
<td>0 (0%) 0 (0%) 0 (0%) 7 (100%) 0 (0%) 0 (0%) 0 (0%) 0 (0%)</td>
<td>7 (100%)</td>
</tr>
<tr>
<td>Games</td>
<td>6 (66.7%) 0 (0%) 0 (0%) 0 (0%) 0 (0%) 0 (0%) 0 (0%) 3 (33.3%)</td>
<td>9 (100%)</td>
</tr>
<tr>
<td>DVD video</td>
<td>0 (0%) 0 (0%) 0 (0%) 3 (100%) 0 (0%) 0 (0%) 0 (0%) 0 (0%)</td>
<td>3 (100%)</td>
</tr>
<tr>
<td>Internet pages</td>
<td>0 (0%) 0 (0%) 0 (0%) 0 (0%) 0 (0%) 1 (100%) 1 (100%) 0 (0%)</td>
<td>2 (100%)</td>
</tr>
<tr>
<td>Timer</td>
<td>0 (0%) 0 (0%) 0 (0%) 3 (100%) 0 (0%) 0 (0%) 0 (0%) 0 (0%)</td>
<td>3 (100%)</td>
</tr>
<tr>
<td>Name chooser</td>
<td>5 (45.5%) 0 (0%) 0 (0%) 0 (0%) 0 (0%) 0 (0%) 0 (0%) 6 (54.5%)</td>
<td>11 (100%)</td>
</tr>
<tr>
<td>Register</td>
<td>0 (0%) 0 (0%) 0 (0%) 0 (0%) 0 (0%) 0 (0%) 0 (0%) 1 (100%)</td>
<td>1 (100%)</td>
</tr>
<tr>
<td>Total - count (% of total)</td>
<td>15 (7.4%) 13 (6.4%) 6 (3%) 35 (17.2%) 41 (20.2%) 68 (33.5%) 18 (8.9%) 7 (3.4%)</td>
<td>203 (100%)</td>
</tr>
</tbody>
</table>

Table 5.15: The number of counts for each stage of instruction related to the resource type
The resources produced by different creators tend to be focusing on different stages of instruction (Table 5.16). Commercially-produced resources are aimed mainly at *presenting stimulus* (35%) and *gaining attention* (26%). Pupils are focused solely on *eliciting performance* as they used the IWB to support such tasks as assisting their performance in speaking and listening tasks. There was no evidence of them being engaged in IWB use under any other stage of instruction. Teacher-created resources were used for all stages of instruction, although predominantly for *guiding the learning* and *presenting stimulus*.

<table>
<thead>
<tr>
<th>Resource creator</th>
<th>The no. of counts for each stage of instruction by different resource creators (Percentage for each resource creator in brackets)</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Gaining attention</td>
<td>Identifying objectives</td>
</tr>
<tr>
<td>Commercial producer</td>
<td>12 (21.1%)</td>
<td>0 (0%)</td>
</tr>
<tr>
<td>Teacher</td>
<td>3 (3%)</td>
<td>13 (13%)</td>
</tr>
<tr>
<td>Pupil</td>
<td>0 (0%)</td>
<td>0 (0%)</td>
</tr>
<tr>
<td>Total</td>
<td>15</td>
<td>13</td>
</tr>
</tbody>
</table>

Table 5.16: The number of counts for each stage of instruction for each of the resource creator types

Most of the individual teachers used the IWB across most of the stages of instruction at some point in the observed lessons (Table 5.17). Indeed, in the case of Abigail, where three lessons were observed, IWB use was noted in seven stages of instruction. As already noted, the stage of instruction with the most counts (68), is *eliciting performance*. However, 55 of the 68 counts for this stage are from one lesson taught by Bryn. It is not the stage with most counts from any other teacher. Rather the stage of instruction that gained most counts in the case of four of the seven teachers is *guiding the learning*. All teachers used the IWB for *guiding learning* as well as *presenting stimulus*. Six teachers used it for *identifying objectives, eliciting*
performance and reviewing/plenary (although not the same six in each case). Five used the IWB for gaining attention and only three used it for recalling prior learning. It should, of course, be borne in mind that differing levels of use might be expected with the different stages of instruction as lessons do not devote the same amount of attention to each stage. Identifying objectives, for example, might be expected to account for quite a limited amount of the teaching time in a lesson. What is perhaps significant, however, is that in this study, IWB use is not closely tied to a limited number of the stages of instruction.

<table>
<thead>
<tr>
<th>Resource creator</th>
<th>The no. of counts for each stage of instruction by the different teachers (Percentage within teacher given in brackets)</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Gaining attention</td>
<td>Identifying objectives</td>
</tr>
<tr>
<td>Abigail</td>
<td>5 (12.5%)</td>
<td>4 (10%)</td>
</tr>
<tr>
<td>Alice</td>
<td>1 (7.7%)</td>
<td>1 (7.7%)</td>
</tr>
<tr>
<td>Beverley</td>
<td>0 (0%)</td>
<td>3 (21.4%)</td>
</tr>
<tr>
<td>Bill</td>
<td>6 (30%)</td>
<td>1 (5%)</td>
</tr>
<tr>
<td>Bryn</td>
<td>1 (1.3%)</td>
<td>0 (0%)</td>
</tr>
<tr>
<td>Cherry</td>
<td>2 (6.9%)</td>
<td>3 (10.3%)</td>
</tr>
<tr>
<td>Deborah</td>
<td>0 (0%)</td>
<td>1 (8.3%)</td>
</tr>
<tr>
<td>Total</td>
<td>15</td>
<td>13</td>
</tr>
</tbody>
</table>

Table 5.17: The number of counts for each teacher for each stage of instruction
5.5.2 English subject content

This study investigates how a group of teachers, who have developed an established practice with IWBs, make use of IWBs to teach English at secondary level. Central to the originality of this study is the exploration of how the IWB is being used to teach English. This is accomplished, within this CA, through considering typical areas of English study, as well as English as conceived by two of the main national frameworks of recent years: the National Curriculum (NC) (QCA, 2007) and the Framework for Secondary English (FSE) (QCA, 2008). Data has been gathered on the attainment target areas of speaking and listening, reading, writing and language. (Whilst language is not one of the three attainment targets, 'Language structure and variation' does appear under its own heading in the Range and Content section of the NC.) Data on these areas should indicate whether the observed teachers use IWBs across these areas or direct its use to certain areas. These areas are broad and so have been broken down, based on the FSE, as follows:

Speaking and listening
- listening and responding
- speaking and presenting
- group discussion and interaction
- drama, role-play and performance

Reading
- reading for meaning: understanding and responding to the print, electronic and multi-modal texts
- understanding the author’s craft

Writing
- composition: generating ideas, planning and drafting
- composition: shaping and constructing language for expression and effect
- conventions: drawing on conventions and structures

Language
- analysing and exploring language
The data analysis instrument, therefore, gathers data on the main divisions and skills involved in English, according to national framework documents. Data is also gathered on the typical English study areas (Chapter 3.8.2) which are reiterated here:

- novel/literary prose
- poetry
- drama/scripts
- non-fiction
- media
- pupil response
- other

**National framework areas**
The teachers in the study as a whole used the IWB to address all of the main divisions of the NC apart from *language* where there were no counts made (Figure 5.12). *Reading* accounted for the largest proportion of counts (43.9%), followed by *speaking and listening* (31.2%) and then *writing* with nearly a quarter of the counts made (24.9%).

![Pie chart showing percentages of counts for each NC attainment target area](image)

**Figure 5.12: The percentage of counts for each NC attainment target area where IWB use was observed**

The data also illuminates IWB use in the teaching of some of the English skills as defined by the FSE (Table 5.18). Within *speaking and listening*, most counts were for *speaking and presenting*. In the case of reading, the greatest proportion were for *reading for meaning* (71.1%), and for *writing*, there was a fairly even split between
composition: generating ideas (40.4%) and conventions (38.3%), with composition: shaping carrying the smallest proportion of counts (21.3%). As has already been noted, there were no counts for language study.

<table>
<thead>
<tr>
<th>Subject divisions and skills</th>
<th>% of counts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Speaking and listening</td>
<td></td>
</tr>
<tr>
<td>Speaking and presenting</td>
<td>93.2%</td>
</tr>
<tr>
<td>Group discussion and interaction</td>
<td>6.8%</td>
</tr>
<tr>
<td>Listening and responding</td>
<td>0.0%</td>
</tr>
<tr>
<td>Drama, role-play and performance</td>
<td>0.0%</td>
</tr>
<tr>
<td>Total (S&amp;L)</td>
<td>100.0%</td>
</tr>
<tr>
<td>Reading</td>
<td></td>
</tr>
<tr>
<td>Reading for meaning</td>
<td>71.1%</td>
</tr>
<tr>
<td>Understanding author's craft</td>
<td>28.9%</td>
</tr>
<tr>
<td>Total (reading)</td>
<td>100.0%</td>
</tr>
<tr>
<td>Writing</td>
<td></td>
</tr>
<tr>
<td>Composition: generating ideas</td>
<td>40.4%</td>
</tr>
<tr>
<td>Composition: shaping</td>
<td>21.3%</td>
</tr>
<tr>
<td>Conventions</td>
<td>38.3%</td>
</tr>
<tr>
<td>Total (writing)</td>
<td>100.0%</td>
</tr>
</tbody>
</table>

Table 5.18: The percentage of counts for the subject skills

NC areas were also examined in relation to resource type (Table 5.19). Nearly half of the counts for ENF resources were for reading, followed by 44.1% for writing and 6.8% for speaking and listening. With PowerPoint, on the other hand, just over half of the counts were for speaking and listening (perhaps skewed by the one lesson of Bryn's with many PowerPoint counts for speaking and listening). PowerPoint had more counts for reading (32) than for writing (20). Most of the other types of resource used
were primarily for reading and across the different types of resources observed, reading attracted the most counts.

<table>
<thead>
<tr>
<th>Resource type</th>
<th>The no. of counts for each type of resource, against the NC attainment target areas (Percentage within resource given in brackets)</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENF</td>
<td></td>
<td>59</td>
</tr>
<tr>
<td>S&amp;L</td>
<td>4 (6.8%)</td>
<td>29 (49.2%)</td>
</tr>
<tr>
<td>Reading</td>
<td>29 (49.2%)</td>
<td>26 (44.1%)</td>
</tr>
<tr>
<td>Writing</td>
<td>26 (44.1%)</td>
<td></td>
</tr>
<tr>
<td>PowerPoint</td>
<td>55 (51.4%)</td>
<td>32 (29.9%)</td>
</tr>
<tr>
<td>Word document</td>
<td>0 (0%)</td>
<td>1 (100%)</td>
</tr>
<tr>
<td>English specialist program</td>
<td>0 (0%)</td>
<td>7 (100%)</td>
</tr>
<tr>
<td>Games</td>
<td>0 (0%)</td>
<td>3 (100%)</td>
</tr>
<tr>
<td>DVD video</td>
<td>0 (0%)</td>
<td>3 (100%)</td>
</tr>
<tr>
<td>Internet pages</td>
<td>0 (0%)</td>
<td>2 (100%)</td>
</tr>
<tr>
<td>Timer</td>
<td>0 (0%)</td>
<td>1 (50%)</td>
</tr>
<tr>
<td>Name chooser</td>
<td>0 (0%)</td>
<td>5 (100%)</td>
</tr>
<tr>
<td>Total</td>
<td>59 (100%)</td>
<td>83 (100%)</td>
</tr>
</tbody>
</table>

Table 5.19: The number of counts for each type of resource matched against NC attainment target areas

With regard to the originators of the resources, it appears that the resources created from the three creators are aimed at different NC areas (Table 5.20). The resources created by pupils were overwhelmingly for speaking and listening (96.5%), and primarily speaking and presenting skills. Commercially-produced resources were predominantly aimed at reading (78.1%). Teacher-produced resources also gained most counts for reading (56%) with three-quarters of these counts being for reading for meaning. Forty percent of counts for teacher-produced resources were for writing, whereas there were only seven counts of resources for writing that were commercially produced.
<table>
<thead>
<tr>
<th>Resource creator</th>
<th>Speaking and listening</th>
<th>Reading</th>
<th>Writing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Commercial producer</td>
<td>0 (0%)</td>
<td>25 (78.1%)</td>
<td>7 (21.9%)</td>
</tr>
<tr>
<td>Teacher</td>
<td>4 (4%)</td>
<td>56 (56%)</td>
<td>40 (40%)</td>
</tr>
<tr>
<td>Pupil</td>
<td>55 (96.5%)</td>
<td>2 (3.5%)</td>
<td>0 (0%)</td>
</tr>
<tr>
<td>Total</td>
<td>59</td>
<td>83</td>
<td>47</td>
</tr>
</tbody>
</table>

Table 5.20: The number of counts for each resource creator for each NC area

In this study, the IWB is predominantly used to support reading and writing by teacher-produced resources. There were very few counts of teacher-produced resources for speaking and listening and no counts in this area of commercially produced resources. Where counts for speaking and listening do appear in number is for one lesson where students used the IWB to support their presentations. This may reflect the balance of English study in the classroom, or it may be that IWB are not considered appropriate for speaking and listening study. Reading was also an IWB focus for all year groups (Figure 5.13). Writing was well evidenced in years 7 and 8, and the use of the IWB for speaking and listening was only evidenced in years 7 and 11, but predominantly in year 11.
The data relating to individual teachers shows different patterns of use (Table 5.21). Most of the teachers elicited substantially more counts (more than two-thirds of their total) on one NC area. The only exception to this is in the data relating to Cherry, where there is a more balanced split between two of the areas (reading 55.2%, writing 44.8%). Alice and Deborah both had a majority of counts for writing whilst Bryn had a majority for speaking and listening whilst the remaining four had more counts for reading. Only three teachers (Alice, Abigail and Bryn) had any counts for speaking and listening. Alice was the only teacher to have no counts for reading and Bill, alone, had no counts for writing. So whilst reading is the predominant NC area overall, there is evidence that most of the teachers are using the IWB for teaching in at least two NC areas (Bill is the only teacher who covers just one NC area).

<table>
<thead>
<tr>
<th>Resource creator</th>
<th>The no. of counts for each NC area for each teacher (Percentage within teacher given in brackets)</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Speaking and listening</td>
<td>Reading</td>
</tr>
<tr>
<td>Abigail</td>
<td>1 (2.5%)</td>
<td>29 (72.5%)</td>
</tr>
<tr>
<td>Alice</td>
<td>3 (25%)</td>
<td>0 (0%)</td>
</tr>
<tr>
<td>Beverley</td>
<td>0 (0%)</td>
<td>13 (92.9%)</td>
</tr>
<tr>
<td>Bill</td>
<td>0 (0%)</td>
<td>8 (100%)</td>
</tr>
<tr>
<td>Bryn</td>
<td>55 (74.3%)</td>
<td>13 (17.6%)</td>
</tr>
<tr>
<td>Cherry</td>
<td>0 (0%)</td>
<td>16 (55.2%)</td>
</tr>
<tr>
<td>Deborah</td>
<td>0 (0%)</td>
<td>4 (33.3%)</td>
</tr>
<tr>
<td>Total</td>
<td>59</td>
<td>83</td>
</tr>
</tbody>
</table>

Table 5.21: The number of counts for each NC area for each teacher

Of the six teachers with counts for reading, five have counts for reading for meaning whilst only three used the IWB for understanding the author's craft (Figure 5.14). The
IWB is used to support comprehension and understanding skills, in the main, rather than understanding how writers use language.

In the case of writing, the six teachers who use the IWB for these skills use it predominantly for only one area, although this skill area differs between the teachers with nearly equal numbers overall between composition: generating ideas and conventions (Figure 5.15).
English study areas

'English study areas' refers to programmes that teachers use to teach the skills demanded by the NC and the FSE. An explanation of their choice can be found at Chapter 3.8.2. The areas chosen are:

- Novel/lit prose
- Poetry
- Play
- Non-fiction
- Media
- Pupil response
- Other.

Figure 5.16 provides an overview of IWB use for the study areas. A sizable number of counts is allocated to novels/prose (28%) and poetry (22.2%). Pupil response, however, attracts the largest proportion of counts, accounting for a third of the total counts for 'English study areas'. These counts do not indicate pupils' responses to one of the other study areas, such as poetry, where a count would have been for poetry. Rather they point out when a response is from pupils' own experience, ideas or thoughts.

Figure 5.16: The percentage of counts for each English study area
Examsining the creator of the resources, against the 'English study areas' reveals that most of the counts for pupil response come from pupil-created resources (55), and indeed these counts are from Lesson 11 where pupils are making their own presentations (Table 5.22). This one lesson accounts for 87.3% of the pupil response counts. It illustrates, perhaps, the potential of IWBs to support pupils' ideas and responses. The remainder of the pupil response counts (8) come from teacher-created resources.

<table>
<thead>
<tr>
<th>Resource creator</th>
<th>The no. of counts for each English study area by different resource creators</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(Percentage within resource creator given in brackets)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Novel/prose</td>
<td>Poetry</td>
</tr>
<tr>
<td>Commercial producer</td>
<td>15 (46.9%)</td>
<td>9 (28.1%)</td>
</tr>
<tr>
<td>Teacher</td>
<td>37 (37%)</td>
<td>32 (32%)</td>
</tr>
<tr>
<td>Pupil</td>
<td>1 (1.8%)</td>
<td>1 (1.8%)</td>
</tr>
<tr>
<td>Total</td>
<td>53</td>
<td>42</td>
</tr>
</tbody>
</table>

Table 5.22: The number of counts of English study areas for each type of resource creator

<table>
<thead>
<tr>
<th>Resource creator</th>
<th>The no. of counts for each English study area by the different teachers</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(Percentage within teacher given in brackets)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Novel/prose</td>
<td>Poetry</td>
</tr>
<tr>
<td>Abigail</td>
<td>38 (95%)</td>
<td>0 (0%)</td>
</tr>
<tr>
<td>Alice</td>
<td>7 (58.3%)</td>
<td>0 (0%)</td>
</tr>
<tr>
<td>Beverley</td>
<td>0 (0%)</td>
<td>0 (0%)</td>
</tr>
<tr>
<td>Bill</td>
<td>0 (0%)</td>
<td>8 (100%)</td>
</tr>
<tr>
<td>Bryn</td>
<td>8 (10.8%)</td>
<td>5 (6.8%)</td>
</tr>
<tr>
<td>Cherry</td>
<td>0 (0%)</td>
<td>29 (100%)</td>
</tr>
<tr>
<td>Deborah</td>
<td>0 (0%)</td>
<td>0 (0%)</td>
</tr>
<tr>
<td>Total</td>
<td>53</td>
<td>42</td>
</tr>
</tbody>
</table>

Table 5.23: The number of counts of each English study area for each teacher
For both commercially-produced and teacher-created resources, the single 'study area' that gains most counts is novel/prose (15 and 37 counts respectively). This is followed by poetry for both types of creator.

Most individual teachers have one 'study area' that gains most counts and accounts for at least 50% of their counts (Table 5.25). The predominant 'study area' differs from teacher to teacher, with five of the 'study areas' gaining the majority of counts for at least one teacher. Three of the teachers focused on only one 'study area' (Bill, Cherry and Deborah); in the case of two of them (Bill and Deborah) only one lesson from them was observed, so it is perhaps unsurprising that only one area would appear. The remaining teachers focused on two to four 'study areas'. Within this sample, IWB use is not confined to certain study areas.

A picture emerges, with regard to English subject content, of a teaching tool which is quite flexibly used across the seven teachers. There may be broad areas where more counts are found - for example, in reading or in novels/prose - but IWBs are used across the target areas of the NC and for a wide range of 'English study areas'.

5.5.3 Summary of pedagogic areas
Within this study, the IWB was used across most of the identified stages of instruction. Whilst most counts were for eliciting performance, many of these counts were for one lesson, and the stage of instruction which gains most counts for four out of seven teachers was guiding learning. Indeed all teachers used the IWB for this stage of instruction, and presenting stimulus. It seems that the presentational capacity of the IWB is being utilised by displaying the stimulus for learning. IWBs are also being used to give pupils the organisation they need - the steps they need to take. It could perhaps be summed up as the technology is being used to provide and display materials, and to give guidance and instructions. There were very few counts of the IWB being used for recalling prior learning, perhaps a surprising outcome as memory is a feature of computer technology. This may be coincidental and due to the timing of the observations or it may be that the teachers do not see the IWB as the venue for
recalling previous learning. There were no counts of the IWB being used for feedback/assessment. Again, this may be due to the timing of the lesson observation not fitting with this stage of instruction, or it may indicate a reluctance to use presentation technology for addressing assessment, which may be considered an individual consideration.

Considering English subject content, there are clear areas where IWBs were being used by the sample teachers. It was extensively used for supporting the teaching of reading, and in particular reading for meaning and comprehension, as opposed to understanding the author’s craft. This would seem to support the observations made noting the use of IWB for presenting stimulus and information. The IWB was used as a site for presenting texts, and for reading and understanding texts. Comprehension of texts was more of a focus than analysis of texts in this study. In terms of speaking and listening, it was used heavily in one lesson for students’ presentations, but otherwise it was scarcely used for speaking and listening. The majority of resources created by teachers were not for speaking and listening, although pupils used the IWB for their presentations. There was no observed use of the IWB for supporting listening skills. Writing secured about one quarter of the overall counts, divided between composition: generating ideas and conventions.

With regard to typical English study areas, the largest single amount of counts is for pupil response, a figure influenced by one speaking and listening lesson of pupil presentations. In light of the number of counts for reading, it is perhaps not surprising to learn that just over 50% of counts are for novels and poetry. However, the CA indicates the importance of written text in the observed lessons where the IWB screen is a place where written text is located and viewed. This text is likely to relate to novels and poetry, and less likely to be media-related, drama-related or non-fiction. The screen of the IWB is used to provide texts for stimulus, comprehension and guidance. Analysis is not so much in evidence. There is some focus on generating writing and studying the conventions of writing, but the IWB is not commonly used for shaping writing. Nor is it a place for stimulating group discussion or practising listening.
skills. Such patterns of use, as noted here, are not generalisable but they present interesting perspectives for considering how IWBs are being used in English teaching.
6 DATA ANALYSIS: INTERVIEWS

6.1 An overview
The data analysis so far has explored the data gathered from systematic classroom observation and content analysis. The final data collection method is the interviews conducted with the case study teachers. Unlike with the previous methods, where data was collected from what was observable to the researcher, this method was designed to gain insight into non-observable evidence. The purpose of each interview was twofold: to gain an appreciation of the individual teacher’s context and to elicit data on the choices they made (in regard to IWB use) for the observed lessons.

The interviews were conducted as semi-structured interviews, and were designed to last twenty minutes. Tightly-focused questions focusing on specific areas (such as length of teaching experience) were followed by prompts on broader areas such as design (Appendix D). Examples of content from the observed lessons, in the form of three or four printed screenshots, provided prompts for the interviews. The screenshots either typified each teacher’s approach, or were unusual within their approach or stood out from the body of content observed from all the teachers. The teachers were also encouraged to provide answers that went beyond explaining the chosen screen shots, perhaps disclosing more about the typical elements of their practice using an IWB (for example, ‘What routines do you use?’) and their rationale for using the IWB at a particular point (for example, ‘So is there an advantage to an interactive whiteboard?’). The final area of questioning related to the nature of training that had been received in the use of IWBs. The interviews were recorded and subsequently transcribed.

6.2 The data analysis process
Unlike the other research methods used in this study, the use of the semi-structured interview is a qualitative approach. Bryman notes the ‘richness’ of qualitative data but also ‘the difficulty in finding analytic paths through the richness’ (2012, p.565). The problem arises, due in part to the nature of the data, which tends to be verbal as opposed to numerical. Dense written texts can appear impenetrable and difficult to analyse. The interviews were transcribed by the researcher. The transcription follows the recorded interview closely, although pauses and utterances that indicate
hesitations such as ‘um’ or ‘er’ are not transcribed. Full stops indicate longer pauses and dashes indicate short pauses.

Within this study, the seven interviews resulted in transcripts of producing a total of over 23,000 words (Table 6.1), with the average (mean) number of words per interview being 3,354. Deborah’s interview is over twice as long as Bryn’s, both in terms of minutes and words. Such variation is a consequence of teacher availability. Twenty-minute slots were booked for the interviews (the average (mean) time per interview was nearly nineteen minutes), but the full amount of time was not always available (Table 6.1). Bryn, for example, has pastoral responsibility which requires responding to unexpected or unplanned demands on his time. The same question areas were posed to all teachers, but there are fewer extended answers from Bryn in particular.

<table>
<thead>
<tr>
<th>Teacher</th>
<th>Interview length (Mins:secs)</th>
<th>No. of words in transcript</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abigail</td>
<td>19:54</td>
<td>3,226</td>
</tr>
<tr>
<td>Alice</td>
<td>22:22</td>
<td>4,037</td>
</tr>
<tr>
<td>Beverley</td>
<td>16:06</td>
<td>2,655</td>
</tr>
<tr>
<td>Bill</td>
<td>15:13</td>
<td>2,949</td>
</tr>
<tr>
<td>Bryn</td>
<td>11:24</td>
<td>2,044</td>
</tr>
<tr>
<td>Cherry</td>
<td>21:21</td>
<td>3,790</td>
</tr>
<tr>
<td>Deborah</td>
<td>23:53</td>
<td>4,775</td>
</tr>
<tr>
<td>TOTAL</td>
<td>130:22</td>
<td>23,476</td>
</tr>
<tr>
<td>Average (mean)</td>
<td>18:37</td>
<td>3,354</td>
</tr>
</tbody>
</table>

Table 6.1: The length of interview and transcript for each teacher

Analysis of dense, verbal data can be complicated by the lack of clear-cut rules for conducting qualitative data analysis (Bryman, 2012). Flexibility and adaptability are required by the researcher because, as Merriam points out, ‘A qualitative design is emergent’ (2009, p.169). The interviewer/researcher does not know ahead of the interview the responses that will emerge and where those responses will lead the
Interview process. Consequently, the analysis of qualitative data is ‘recursive and dynamic’ (Merriam 2009, p.169) and evolves as the study develops.

This study involves a thematic analysis of the data. The choice of themes (Table 6.2) was influenced by the areas of questioning and the responses.

<table>
<thead>
<tr>
<th>Theme</th>
<th>Brief description of theme</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Content type</td>
<td>The type and origin of content shown on the board</td>
</tr>
<tr>
<td>2 Design of content</td>
<td>Consideration of the design of teacher-created resources</td>
</tr>
<tr>
<td>3 Planning</td>
<td>How IWBs affect and relate to the planning of lessons and learning</td>
</tr>
<tr>
<td>4 Pedagogical focus</td>
<td>Data relating to teaching and learning strategies and considerations</td>
</tr>
<tr>
<td>5 IWB operation and features</td>
<td>Factors relating to the practical use and manipulation of the IWB</td>
</tr>
<tr>
<td>6 Student use</td>
<td>Data focusing on student use of the IWB</td>
</tr>
<tr>
<td>7 Training</td>
<td>Information on training for IWBs</td>
</tr>
</tbody>
</table>

Table 6.2: Themes for analysis

A framework analysis approach was adopted to support analysis of the themes (see Chapter 3.9.4). Framework analysis encourages the division of each theme into sub-themes; the sub-themes emerge from the data that arises from the interviews. The sub-themes were decided through a recursive process of reviewing the ideas raised in the interview data, and searching for links between these ideas, so that they would fit into manageable clusters of ideas, or sub-themes (Table 6.3).

A matrix was created for each theme. Each matrix showed the sub-themes for a particular theme, and summarised the key data from each interview relating to the sub-theme, thereby providing an outline of the key data relating to each sub-theme for every teacher in the study. See Appendix E for an example of a completed matrix. (For a fuller explanation of framework analysis, see Chapter 3.9.4).
<table>
<thead>
<tr>
<th>Theme</th>
<th>Sub-themes chosen for framework analysis</th>
</tr>
</thead>
</table>
| **1 Content type**           | a) Teacher-produced content using IWB software  
                              | b) Teacher-produced content using generic software  
                              | c) Externally generated content |
| **2 Design of content**      | a) Written elements  
                              | b) Non-written elements |
| **3 Planning**               | a) Planning using Electronic Notebook/Flipchart and/or PowerPoint  
                              | b) Sharing planning with students  
                              | c) Spontaneous planning  
                              | d) Limitations on planning |
| **4 Pedagogical focus**      | a) Directing the learning  
                              | b) Presenting stimulus  
                              | c) Shared learning  
                              | d) Modelling  
                              | e) Analysis  
                              | f) Assessment  
                              | g) Differentiation |
| **5 IWB operation and features** | a) IWB software tools & peripherals  
                              | b) IWB capability  
                              | c) Operational issues |
| **6 Student use**            | a) English skills (reading, writing, speaking and listening)  
                              | b) Knowledge and attitude  
                              | c) Limitations |
| **7 Training**               | a) Official and school training received  
                              | b) Training needs and constraints  
                              | c) Training source: self  
                              | d) Training source: other teachers  
                              | e) Training source: External |

Table 6.3: Themes and sub-themes for the framework analysis
The interviews were conducted with the teachers within a month of their observed lesson(s) then the interviews were transcribed within a few days of the interview taking place. Once transcribed, the interviews were read and annotated to establish possible themes for analysis. This initial coding stage identified approximately sixty areas or categories arising within the data. Through a process of clustering similar topics, and then using colour-coding to pinpoint the frequency of these categories throughout the interviews of the seven teachers, the categories were clustered into twelve themes. (The term 'theme' refers to an identifiable category, relating to the research focus, which builds on the codes used within the analysis to help provide a theoretical understanding of the data (Bryman, 2012, p.580)). Using the NVivo data analysis program to support the process, relevant data was selected from each interview and entered into the appropriate theme. Each theme was further analysed and sub-themes were established. To assist in the reduction of the interview texts into meaningful and significant data, a sub-theme had to elicit data from at least two teachers in the study to be included in the matrix.

A further review of the themes led to their reduction in number from twelve to seven (Table 6.2). The themes omitted from the original twelve were:

- Attitudes - considers teachers' attitudes to IWB use
- Collegiate practice - consideration of how IWB are used with other colleagues, e.g. whether resources are shared between teachers
- Experiences - focusing on teachers' experiences of using IWBs
- IWB impact - looking at impact on teachers' practice
- Phases - IWB across different school phases e.g. Key Stages 3 and 4

These themes were left out for a number of reasons, for example because they did not elicit enough data from a range of teachers or because they did not contribute significantly to the main research question.

6.3 Theme one: content type

Within this theme there are three sub-themes:

1. teacher-produced content using IWB software
2. teacher-produced content using generic programs
3. externally-generated content.

6.3.1 Teacher-produced content using IWB software

These sub-themes emerged from the review process, described above (Chapter 6.2), but they are also designed to connect with the analysis of the other data sets in this study. The SCO data drew attention to the software that accompanies the IWB, referred to by manufacturers as the electronic notebook or electronic flipchart, known as ENF in this study.

ENF applications provide a range of potential content via a gallery of resources and online content. The gallery includes templates, images and backgrounds. Abigail refers explicitly to using some of this material: ‘... there's templates set up already and you can choose from them... There's absolutely loads on there where you can choose from a range and put them together.’ She refers to this gallery as a ‘resource’ a number of times in the interview and always in positive terms. However, Abigail is the only teacher to refer to this resource. It is not evident from the data as to why Abigail is the only teacher to raise this as a significant source of content. It may relate to knowledge of the program, ease of use, accessibility of the resource, or another reason. However, overall there are few references to content deriving from ENF applications. Alice makes use of Promethean Planet - an online source of teaching resources and Bill also refers to using content from Smart Tools. Cherry mentions using Tickertape - a moving display of limited text. This is an ENF tool although Cherry states that she generally doesn't use the board's own software, preferring to use PowerPoint instead.

Data from the CA conducted within this study, reveals teachers using either ENF or PowerPoint, but not both. Within the interviews, most of the teachers express a tendency to use one application and not the other, and this is expressed as a definite preference by some: ‘I'm not a fan of PowerPoint at all’ (Deborah). Bryn expresses a sense of dissatisfaction and perhaps regret at not using ENF software. When asked whether he uses ENF software, he responds ‘Not enough - not enough.’ He appears to
recognise it has value, but it does not form part of his content bank, although he does not reveal why. Interestingly, Bill is the only teacher who refers to making use of both PowerPoint and ENF: ‘Almost every lesson - 99% of lessons - has a PowerPoint that I use or a Smart Tools piece of software.’ This study suggests a possible typology of teachers who use ENF, teachers that use PowerPoint and teachers who use both.

6.3.2 Teacher-produced content using generic programs

This sub-theme focuses on content produced by teachers, using software other than ENF resources. PowerPoint is the single most mentioned program, whether in a positive or negative sense. The association of PowerPoint with IWBs is strong. Three teachers confirm that they use PowerPoint content in lessons, with Beverley and Cherry expressing a preference for PowerPoint over ENF. Cherry explains that access is the key factor, as she has PowerPoint on her laptop, and can access it at home. Bill infers that PowerPoint is commonly used on IWBs, when he states that he purposely uses other packages to add variety to his content. Deborah is the one teacher in the study who shows antipathy to PowerPoint. She uses it ‘very rarely’ and specifically for timed activities.

The only other programs mentioned in terms of teacher-produced content are Word and Excel (by Beverley). Other teachers mention showing worksheets or different proforma on the IWB, to reflect worksheets that the pupils have in front of them, but they are not resources designed specifically to be used on the IWB. Within this study, the content created by teachers is mainly produced using PowerPoint and ENF.

6.3.3 Externally-generated content

A range of externally-produced content was named as being used by the teachers such as timers, name-generators, video and games. The most mentioned type of external content, cited by six of the teachers, is images. The source of the images is given by some teachers. ENF programs provide a gallery of images, and Abigail refers to using images from this gallery in her content. Beverley and Cherry, predominantly
PowerPoint users, use Google Images to import pictures from the Internet into their presentations. Images are included in their content for different reasons, such as creating mood (‘somewhere calm’ - Abigail), providing a discussion stimulus or as a means of illustrating a text. Images form a significant part of the IWB content for the majority of the teachers in the study.

Of the other types of externally-produced content raised by the interviewed teachers, the Internet is mentioned by four teachers. Two teachers describe the value of the Internet for adding topicality to the work done in class, including Beverley: ‘With my year 7 group we were doing the Japanese tsunami - so we were able to watch the news at the start of lessons - to get into the flow of things and to get them the most up-to-date information.’ (Beverley) The IWB is used to present material that is current and relevant. The Internet also provides multimedia content. Bill, for example, engages the use of an online calculator on green issues.

The data shows that individual teachers are using a range of content including video, quizzes and educational software. Alice, for example, mentions four sources of content: ENF, content from Promethean Planet, images and material from YouTube. Content may also be influenced by what colleagues are using and the resources available in within a department; both Bill and Bryn from Brightley School make use of Daydream educational software.

6.4 Theme two: design
Moss et al. note that ‘many teachers struggle to incorporate principles of design which can establish clear reading paths for pupils’ (2007, p.5). In order to investigate this area, questioning was directed at exploring where and how the sample teachers are applying design principles within the materials they use on the IWB. Two sub-themes emerged from the coding and categorisation process:

1. design of written elements
2. design of non-written elements.
These sub-themes distinguish between content involving written text and content which is non-written, for example pictures, backgrounds and animations. The data analysed emanates mainly from five of the teachers as there was very little data from Bill and Bryn on design aspects.

6.4.1 Design of written elements
Three of the teachers state that they make specific choices in their use of fonts. Comic Sans is chosen by Abigail, Cherry and Deborah. Alice does not mention this in her interview, but Comic Sans is used in her observed lessons. Abigail explains she has read research ‘saying how Comic Sans is the best font to use with young children because it’s similar to their actual handwriting - the shapes of the letters’. Cherry also associates font choice with age. She uses Comic Sans for Key Stage 3 teaching because ‘it’s almost round isn’t it - it’s very soft - almost primary schoolish’. With older pupils she uses different fonts, although something ‘still rounded and easy to see’. Deborah she has given deliberate thought to her choice of Comic Sans: ‘It forms most of the letters properly - modelling how they should structure most of their letters anyway’ apart from ‘the way there’s no curl on the ‘t.’ So Deborah sees the choice of font as both a vehicle for content and as a part of the modelling process she is using within the lesson. She describes this font as ‘the English Department font’, so it seems that it is widely used within her department. Beverley is less rigid but given a choice ‘I’d pick Arial because it’s clear - and I write everything in Arial’. These teachers are able to name their font of choice, and their reasons for using a particular font relate to clarity, association with handwriting, the shapes of the letters and the ages of the learners. This suggests a considered and purposeful approach to design when considering the choice of font.

Asked about font size, again some are very clear about what is right for their context. Without hesitation, Abigail reveals she uses size 24 and Deborah is similarly specific: ‘I hit upon 26 being roughly about the right size - that is big enough to read - not too big to be overpowering.’ Beverley and Cherry are less specific, so ‘something you’re going to be able to see from the back of the room’ (Cherry), keeping it ‘quite big’ (Beverley).
The amount of text on a page is a further consideration. Abigail and Deborah both describe limiting the text on the pages. ‘I try not to have too much writing on there and try to have spaces between otherwise it can look too cluttered.’ (Abigail) This 'rule of thumb' approach is also followed by Cherry, who looks at a slide and considers how it ‘visually...works’. She recognises the need to leave space for annotations when necessary.

Three of the teachers made points related to the colour of the written text. Abigail and Cherry both use coloured written text to signify important text, questions or main points, (Figure 6.1). Deborah deliberately chooses a black or blue font, in order to replicate the pupils’ own writing.

![Figure 6.1: An example of the use of colour to highlight text](image)

### 6.4.2 Design of non-written elements

The non-written elements refer to aspects of design other than written text, for example background, colour and images. Non-written aspects are particularly important to Abigail. She describes her approach as, as ‘colourful’ and ‘visual as possible’. She likes to use her designs to attract attention and interest by using images and animation: ‘It's so quick to do - to make something look a little bit more stimulating for the students’ (Abigail).

Alice uses colour, background and image to create an identity or house style for a set of resources. This applies to every scheme of work she works with. ‘So for our Shakespeare at the moment they’ve got the Shakespeare masks in the background.’ Alice is clear about the positive impact of this approach. It provides an expectation
within the pupils: ‘...they know when they come in the class - that’s the scheme of work.’ Cherry also makes use of colour, backgrounds and images. With backgrounds ‘sometimes they’re colour-coded - depending on key stages - so at Key Stage 3 I tend to use more primary colours’ (Cherry).

Two of the teachers opt, very definitely, for plain white backgrounds in their designs. In the case of Beverley this a pragmatic decision to be focused on the content rather than the presentation. Deborah is similarly focused on content but her decision emanates from her interest in supporting dyslexic pupils. Because each dyslexic student’s needs are individual, she does not try to use different coloured backgrounds or pens. ‘I try to have my board the same as their page. Their page is white my board is white. Their ink is black or blue - my ink is black or blue. So that the transference is a little bit easier for them.’ (Deborah)

Analysis of the interview data on design, reveals that some teachers are consciously designing content, and have set themselves very clear guidelines or principles for design. Abigail, Alice and Deborah appear to have developed a clear house-style in their resources. Other teachers are not so deliberate in their approach, choosing a less rigid approach. Beverley and Cherry have developed their own ways of working, but the overall effect is that they demonstrate a more instinctive approach to design. These two contrasting approaches - one a very conscious shaping of design and the other a more unconscious or intuitive approach - suggest a typology of design approaches amongst the teachers.

6.5 Planning

Questions of design are inextricably linked to planning. Haldene points out the ‘new planning process’ with regard to IWBs, in which teachers must make choices on what to present and how to present it (2007, p 266). This section will analyse the interview data with regard to the planning of teaching and learning in lessons where an IWB is
frequently being used. The evidence that emerges from this bank of data is considered within the following subthemes:

- planning using ENF/PowerPoint
- sharing planning with students
- spontaneous planning
- limitations on planning digitally.

6.5.1 Planning using ENF/PowerPoint

Wright, Peverett and Ellis sum up the complexity of planning learning: ‘The planning stage includes a consideration of aims, justifications, concepts, strategies, assessment and resources’ (2011, p.42). Planning is a multifaceted and complicated activity, and this section considers how PowerPoint and ENF affect the process. Beverley acknowledges PowerPoint’s strength as a management tool - ‘It’s a very good way of organising your lesson’ - but she also considers the fundamental question of whether a PowerPoint can be considered a lesson plan. Arriving at her current school, she didn’t consider that a PowerPoint was a lesson plan: ‘...we had quite a debate about it.’ Since working at the school, her view has changed to the extent that ‘...now I can accept that if you are having your objectives and your outcomes... and your activities and whatever - that for a normal day-to-day lesson could constitute a lesson plan.’ Her own scepticism has been allayed somewhat and she accepts that a PowerPoint can amount to a plan, although her acceptance is qualified.

Deborah uses ENF to support her planning: ‘I use the Notebook file very much as my lesson plan’ and she types up each stage of the lesson. She uses the ENF file as a script and prompt. Whilst planning lessons at the weekend ‘it works out what I’m going to say - and it's there to remind me what I'm going to say’. The use of ENF enables Deborah to plan prompts and questions beforehand.

It is not just short-term planning for individual lessons that is taking place. Cherry confesses to ‘ridiculously long’ PowerPoint presentations ‘a hundred and four slides long’. This represents ‘a term’s worth of lessons and then I can chop and change each
year - depending on my group et cetera’. Here the PowerPoints take on the role of both medium-term and short-term lesson planning. However, flexibility is inherent in this planning as Cherry adjusts the presentation to suit the needs of each cohort. Digital planning lends elasticity to Cherry's lesson preparations.

Digital planning also has an influence in the medium-term planning in Doversford's English department. The installation of Smartboards into every English classroom means that schemes of work can contain explicit reference to IWB resources, and planning can take more account of multimedia resources, for example. Deborah describes one example of a scheme of work where students design a dream school: ‘I've got a clip from Jamie Oliver’s Dream School that I'm going to show them...where he tells them what his vision for Dream School is - so then they can go out and set their own vision for that...’ Here, there is a sense that the IWB creates opportunity and flexibility for the whole department, not just one teacher.

Abigail considers the effect of planning on the learners. Whilst asserting that planning and preparation do not have to be time-consuming for the teacher, she points out that by using digital resources such as ENF and PowerPoint ‘it looks like lots of effort has gone in’ and this impresses learners. Abigail used ready-made animations and images in her content, and here she reveals what she feels is the positive effect of this.

6.5.2 Sharing planning with students

A lesson plan traditionally has a limited audience. Primarily it guides and instructs the teacher (although it may be viewed by others such as management). Learners themselves are generally not privy to the full text. If planning is being done by some teachers via ENF or PowerPoint, not only does it indicate a new approach to planning, but it extends the audience for the plan to the students themselves and indicates a potentially heightened awareness of the lesson plan for this new audience.

Three teachers made comments related to how explicit the lesson planning was made to students. Discussing her use of PowerPoint, Beverley commends its organisational
qualities: ‘It's a very good way of organising your lesson and making it clear for the children’. She sees the dual benefits of using the technology to support the structure of the lesson, and making this structure apparent to the students. Deborah also sees value in making the structure of the learning explicit to the students as well as the teacher. She uses a specific example of using ENF software to do a modelling exercise and describes how she might do this for both her and her pupils:

I leave myself the prompts to remind myself what I've got to do in many ways - and I use that as my writing frame in the same way as I want them to use it as their writing frame. So I'm giving myself the titles just like I'm giving them the titles. So for the lower groups I might even have printed that off with the headings and they would fill in the writing as I filled in the writing.

In this example, the structure created is for both the teacher and the pupils. Printing the framework provides extra support for particular pupils. The audience for the plan has been extended, and there is an overlap between plan and resources.

Alice maintains a distinction between planning and resources. She keeps instructions on the IWB ‘as explicit as possible and what I'd write on my lesson plan I wouldn’t write on the board’. She explains that her lesson plan will contain vocabulary unsuitable for the pupils. Alice, a newly qualified teacher, regards lesson plans as a personal document containing information for the teacher, that is not required by the students.

6.5.3 Spontaneous planning

An area related to planning, raised by two teachers, is that of IWBs supporting spontaneity within the lesson, enabling the alteration of lesson planning as the lesson progresses. During one lesson, Cherry used the IWB to show photographs of other students’ work on the same topic. She confirms that the inclusion of this work on the IWB was a spontaneous decision.
... the pupils didn’t seem to quite be getting out of the task what I wanted them to so that I thought that if I showed them the examples from my other year 10 class that they’d be able to access the task a little bit more – but it wasn’t something that was planned into the lesson.

Cherry used the facility to display digitally stored content to the whole class when she perceived it was needed. The IWB added flexibility to her approach, enabling Cherry to meet the needs of students at a particular moment in their learning. Whilst a spontaneous action in the lesson, foresight was needed to do this. She states ‘...it is something that I'd already got saved and obviously I'd made a conscious decision to photograph and save work in case it was needed’, indicating that this is a teacher who has adapted her modus operandi to allow for the flexibility allowed by the IWB.

Such flexibility is also dependent on the teacher's knowledge of his or her resources. Bryn, the longest serving of the teachers in the study, revealed how his own knowledge supports spontaneous planning: ‘I know what is at my disposal - and you know if I can utilise something that is there that I wouldn't normally have planned to use - then yes absolutely. That's something I do regularly.’

### 6.5.4 Limitations on planning digitally

There were some limitations or constraints related to planning for IWB use that were raised during the interviews. Beverley declares that she likes to have something which shows her what is coming in a lesson and initially she was uneasy that ‘with a PowerPoint you don't know what's coming’. This refers to how a PowerPoint presentation appears in a pre-set linear order and, unless you have a printout, you cannot be sure of what slide is coming up next. Beverley also alludes to the effort needed to create a PowerPoint, when she states that it is an effective way to plan ‘when you've got the energy to use it’. In her experience, at least, PowerPoint requires effort beyond normal lesson planning.
Cherry raises the important issue of access to the programs used on an IWB. Logistical factors influence her planning:

*I always use PowerPoint rather than using the board’s own software. That’s simply because I suppose it’s ease of work at home – you know I’ve got PowerPoint on my laptop whereas I don’t have the software that’s needed to be able to put together the flipcharts.\* Not having access to the ENF program on her laptop is consequently affecting not just her planning, but her overall use of the IWB.

6.6 Pedagogical focus

This thematic area focuses upon how the sample teachers consider IWBs as a pedagogical tool, supporting the processes of teaching and learning within the English classroom. Within this theme, there are seven sub-themes. As with the other sub-themes, the categories were established by reviewing the interview transcripts, identifying subject matter related to the theme and clustering ideas of a similar nature. Some of the sub-themes are quite focused and specific (e.g. modelling) whilst other sub-themes are less specific and are an attempt to draw a number of related ideas, raised by the teachers, under a general heading (e.g. directing the learning). However, the sub-themes created endeavour to reflect the different areas raised by the teachers in the study. They are as follows:

- directing the learning
- presenting stimuli
- shared learning
- modelling
- analysis
- assessment
- differentiation.

6.6.1 Directing the learning

Every teacher in the study referred to using the IWB to direct the attention of the students and to guide their learning. Abigail describes how the IWB provides
‘something to get their eyes looking at the board rather than wanting to look round at each other’ so providing a clear focal point for students.

The IWB is also regarded by some of the teachers as a visual structural aid to the lesson. Abigail, Alice and Bryn all talk about how they use the IWB to indicate the structure of the lesson and to introduce helpful routines. For Bryn, the IWB supports the provision of structure to his lesson and the IWB can be used throughout his lesson: ‘...starter - mini-starter - plenary - mini-plenary - anywhere in a lesson.’ He also states the IWB can refocus a class: ‘...if I feel things are getting a little bit frayed around the edges in terms of managing my class – I just drop it in to bring everything back together – you know to regain the focus on the group.’

Abigail describes how the IWB supports the transition between different parts within a lesson. It works as ‘a signal to them that it’s time now - it’s a different part of the lesson.’ Abigail uses it to reinforce the school structure: ‘We’ve gone to this ‘Present, Apply, Review – Present, Apply, Review’ sort of model at the moment. And it’s to encourage teachers to keep reflecting and reviewing during the lesson...’ She uses the IWB to indicate the lesson stage, and to help the pupils appreciate their progress: ‘I like to do that - I think - so that they can see - not that the end is near - but that almost they can see they’re making progress themselves.’ Abigail also uses a colourful screen to introduce a regular reading for pleasure slot in the lesson. ‘I think I've just set up a routine now where the students do like reading - they're in the habit more than anything.’ She uses the IWB to establish routines and to create a smooth transition from one part of her lesson to the next.

Alice also refers to the IWB supporting the structuring of the learning - specifically at the start and end of lessons:

Every lesson starts with the learning objective on the board. ...I’ll stand by the door – it’s up on the board – the kids know when they come in they write date title learning objective – they’ve instantly got something to do. So that will be the start. It will always end with referring back to the learning objective and how they’ve achieved it...
Interestingly, having the work up on the board means that she can stand by the door to welcome students into the classroom. A clear structure and a routine have been established with the help of the IWB. The IWB is doing the information-giving function at the start of the lesson. This is a situation which Alice alludes to again when she refers to the IWB as a means for providing instructions: ‘It definitely sets up what the challenges are in the lesson and what they need to do and it makes it clear for them because rather than me just saying it they can see the instructions.’ Here, Alice clearly distinguishes between her own role in giving verbal instructions and the IWB’s role in providing visual instructions.

By distinguishing between her role and that of the IWB, she gives the IWB a sense of agency. This role involves providing visual reinforcement of the teacher’s message. Both Abigail and Alice draw attention to this role of providing a visual reminder of the teacher’s message. Abigail says it’s ‘almost just reinforcing what I want from them... it’s almost implicit rather than me saying this is what I want’ and Alice echoes this when she says ‘it gives them a visual... rather than just listening to me talking... it allows them to refer back and it stops me from repeating myself.’ Both of these teachers see a particular role for the IWB in supporting the teaching workload by providing visual reinforcement of their messages.

Some of the teachers use the IWB to draw attention to key words and information. Abigail uses colour to draw attention to key text. Bill uses the facility of the ENF program to quickly enlarge text. He explains: ‘I really liked it as a way of emphasising the part of the board I was talking about - and if the kids can see the words moving and getting bigger then their attention will immediately go to that bit.’ Just as Bill uses the movement involved in enlarging text to catch the attention of students so too Cherry uses motion to attract attention. She has used ‘tickertape’ - a scrolling display of text on screen - ‘to display an objective or to remind of key things that need to be done - homework et cetera’. Such features, requiring motion, could not be replicated by a traditional whiteboard.

Two of the teachers state that they use the IWB to reinforce instructions to a class. Alice explains that the visual reinforces the spoken instructions: ‘...rather than just me
saying it they can see the instructions.’ She adds that this is particularly useful for students who start on a task and then need prompting with the next task: ‘...so they'll refer to it and be “Right okay the next stage is this” and then it's always got the extension afterwards.’ Alice considers that having the instructions on the IWB should stop repeated questioning of the teacher. Deborah also uses visual reinforcement of her spoken instructions: ‘I try to have - for almost every task - what my instruction is on the board.’ She doesn't read the instructions out from the board: ‘I don't think that helps because you're not teaching them to read it for themselves but I do have it up for reinforcement.’ Both teachers use the IWB to reinforce the teacher’s instructions, and to remain as a reminder to students. There is a sense from the teachers that this cuts down on unnecessary interruptions and leads to more efficient use of their time in the classroom.

Beverley also refers to using the IWB for more efficient use of both the teacher’s and students' time. She now uses PowerPoint to consider information that she would have asked students to write down previously: ‘I realised the average child was writing a side of A4 within fifteen minutes of the start of the lesson – which creates loads of marking but also it’s just exhausting for them – to then go on to a full-blown writing task.’ By using PowerPoint to bring ideas into the classroom for discussion, Beverley finds that the IWB is eliminating unnecessary steps in the teaching and learning process, i.e. unnecessary copying and marking.

Deborah and Beverley also value the storage capability of IWBs. Deborah finds that referring back to previous work and notes is ‘the biggest benefit’ of working with an IWB. Beverley notes how the IWB - and specifically PowerPoint - is ‘easy to go back to - so you can copy and paste various slides and duplicate them.’ In particular, she likes the ability to revisit content, and to bring ideas already taught into her current teaching. These teachers seem to appreciate the control over their resources that the IWB allows. It appears that the IWB affords and supports a reiterative process which helps them to direct the learning.
6.6.2 Presenting stimuli

Four of the case study teachers indicate how they use the IWB to stimulate ideas and responses from students. Using a visual stimulus is specifically mentioned by Alice and Beverley. Alice used pictures of stars on a presentation about identity, and wanted the students to consider what the stars might represent. This had the effect of engaging the students in a challenge or puzzle in order to stimulate their engagement with ideas. Alice also used images to ‘spur their thinking... especially when we're looking at creative writing’. Beverley’s use of images focused on the performance of a play to help pupils appreciate a text in performance: ‘They find it difficult to understand audience response if they are just sitting reading’. She provided them with images designed to show a variety of interpretations of the play, in order to stimulate students’ own response.

Alice and Beverley both state that they use IWB content as a stimulus for talk and discussion. For example, when considering a current news topic with her year 7 class, Beverley displayed Internet news reports at the start of each lesson to encourage talk about the topic.

6.6.3 Shared learning

Five of the teachers comment on their experiences of using the IWB to encourage collaborative and shared learning. The large screen of an IWB allows a class to look at one text together. This enables joint consideration of texts. Beverley points out that pre-prepared texts can be projected, enlarged and annotated ‘for the children to be able to see things’. Projecting colour images ‘ means that they can look at it as a whole class - and they're all looking - and it's directing them to a certain point’ (Alice). These teachers appreciate the shared experience this allows. Alice states that she uses a lot of images because ‘it gives them a discussion but it enables them to write - especially when we're looking at creative writing.’

Abigail explains how, when using the IWB, she feels like she is ‘trying to get them involved in the process rather than just telling them the process’. She is distinguishing between merely presenting information on a IWB and active engagement, in some way, with the material being shown. Whilst she recognises that displaying information
is a valid use, Abigail does not want to use the IWB for only displaying information. Rather she wishes to develop her capacity to work on the IWB - developing the material on screen - so that students feel more engaged with the material and consequently the learning. Abigail sees the IWB is a catalyst for student involvement in the learning. When discussing one particular lesson, where students worked in groups and then fed back ideas via the IWB, she describes where they wrote on the board as ‘their own separate space’. Each group had a clearly identifiable space, with the idea that the groups looked at each other’s work and learned from each other. Cherry describes a similar experience where she invited students to write responses on the IWB because she wanted them ‘to be able to access each other’s work’. It is not something she does every lesson, but ‘every now and then’. It seems that, with both teachers, this may be a type of use they are developing.

Alice describes two occasions when she used the IWB to encourage a process of shared learning in circumstances which might be considered sensitive or awkward. In the first example she describes using IWB to model this process of sharing personal information: ‘I did an example of a storyboard of my first day from the form tutor’s perspective and so because I shared it with them they didn't feel afraid to share their first day and their different feelings.’ The second occasion relates to students getting things wrong. She set up a true/false game, where students had to move an answer to the appropriate box. However, if the student initially chooses the incorrect box ‘that sparks the discussion to allow them to self-correct themselves’ rather than getting it wrong, or being corrected by the teacher. Because the activity happens with the whole class, they are all party to the mistake and the discussion, and therefore the learning.

Abigail referred to two other forms of technology which, when used in conjunction with the IWB enabled a shared learning process. Video cameras that have been used for speaking and listening activities can be linked to the IWB and ‘very quickly you've got the students' work - the actual speaking - on the board - to show the class and to show themselves’ (Abigail). For Abigail, it is significant that the class learn from each other, and the IWB assists this process. She also uses a visualiser to share the work of individuals with the rest of the class. As Abigail points out, ‘...you can annotate a student's work together. That's really really effective.’
Beverley agrees with Abigail on the value of teacher and students doing an activity together. She describes how she sometimes completes a task alongside the students: ‘...you can put up the version of the sheet they’ve got on the desk... And you can freeze a shot and then you can bring up the grid and you can fill it in with the children...’. Here the teacher is leading but there is a sense of collaboration as the teacher is using exactly the same resource as the students. The students are benefiting not only from seeing the process but also from listening to the questions that are being asked and answered.

As well as using the IWB for mutual understanding, Deborah describes a creative use of the IWB when her class wrote a class poem: ‘I get them to come and write the line on the board in turn.’ The creative process extends to creative use of the tools on the IWB as ‘they always pick different colours to write in and stuff like that.’

6.6.4 Modelling

Modelling was a specific pedagogic strategy raised in relation to IWB use by five case study teachers. Asked about specific purposes for using an IWB in English teaching, Abigail responded:

I would say definitely for modelling – any sort of modelling whether it’s within texts or writing – that is so much more effective than PowerPoint for example because you can write on there – and get the kids up there – and you can show them the process together and they can help you and that sort of thing.

Abigail uses ENF in preference to PowerPoint and in this statement she reveals one of the reasons why is that you can work on a text 'live' with a class. She believes that modelling, and involving the students in the modelling process, gives them confidence in tackling a task. Alice also uses the IWB for modelling. She finds that it is a successful strategy and brings clarity for the students: ‘...it shows them what they need to do to achieve the learning objective.'

Beverley uses the IWB to model textual analysis, as do two other teachers: Bill and Deborah. Bill finds it particularly useful with GCSE students:
...modelling annotation is really important for GCSE particularly and it’s something the pupils struggle with quite a lot... it’s nice to be able to show that on the board - and again get them doing it - get them interacting because if they can come up and draw on the board they can draw on their own sheet.

Like Abigail, Bill sees the involvement of students in the process as an important aspect of the learning. He feels that showing that they can do it on the IWB means that it is more likely they will be able to repeat the process in their own work. Bill is equating the IWB with what the students have in front on them on the desk, and this is a practice followed by Deborah. When the students are working on annotation, she often displays the same text on the IWB: ‘...otherwise they’ve got no concept really of where to put their annotations.’ She does the same with worksheets, so there is no ambiguity of how to fill things in.

6.6.5 Analysis

Despite the fact that analysis did not appear prominently in the observed lessons, it features with the teachers’ interview data as a significant area. Six of the teachers refer to using the IWB for analysis activities with classes. Cherry regards highlighting and annotation as a very common activity for English teachers: ‘...it's probably the tool we use the most or the one I tend to use the most anyway.’ It is an activity spoken about with particular regard to Key Stage 4. Bill considers annotation to be the main purpose for using an IWB at Key Stage 4: ‘Annotation... that's their primary purpose. There's lots of nice things you can do with the Notebook software to get the kids engaged but the actual meat of the content - there's a lot of annotation in Key Stage 4.’ Abigail also refers to using the IWB for annotating and highlighting texts with Key Stage 4 students, specifically looking at ‘past exam papers and looking at the unseen prose’. Bryn values the process of annotation using the IWB and comments that he has regularly used the IWB to annotate and save texts studied at GCSE level. Deborah and Beverley both mention using the IWB for annotating media texts. Beverley describes using it for film analysis, and working with stills from the film: ‘You can freeze the shot and then write all over the shot and that helps the children.’ Deborah describes using
the IWB to analyse film posters in a GCSE unit of work: ‘I used to use the Rocky Balboa trailers poster... I'd circle and annotate that. Did it on the board with them.'

A picture emerges that analysis (along with modelling) is the serious or focused work done on an IWB. Analysis of texts is a key skill, particularly at GCSE level, which is specifically mentioned by four of the six teachers who talk about analysis.

6.6.6 Assessment

Three of the seven teachers refer to using the IWB in relation to assessment. Abigail uses the IWB to focus on target-setting. She uses colourful images and animations to engage students in setting targets. ‘...rather than “What are you going to do to meet your target?”... I'll have stars in the background and ask the question “How are you going to reach for the stars? What targets are you going to set?”’ She uses visual metaphors to intrigue and motivate students.

Alice and Bill describe ways in which the IWB allows for swift assessments of students' understanding and achievements. Alice describes the value of devising true/false activities where students themselves work out whether they are right or wrong. The students have to take a decision at the board, but if they are wrong, they can change their choice. Alice believes that allowing them to change their minds helps them to self-correct and learn from their mistakes. Bill describes how he can assess students’ understanding whilst they are working at the board: ‘I can assess how actually they're doing it in a way that I wouldn't if it was just me modelling.’ By having the students at the board, Bill is able to assess how well the students know the topic. The feedback to the teacher is both insightful and immediate.

6.6.7 Differentiation

The final pedagogic area considered here is the capacity for IWB to support differentiation. Only two of the teachers describe situations where the IWB is used to provide differentiated content for students. Beverley explains occasions where she uses PowerPoint to support EAL learners: ‘...if we've got an EAL learner in the class it's a good idea to use PowerPoint so they don't have to cope with your handwriting... so I make more of a conscious effort to use it in those lessons.’ Bryn is conscious of how
the IWB caters for different learning styles: ‘...it’s visual - it moves - it’s got sound in certain bits - so it caters for the kinaesthetic leaner and the visual and the auditory learner.’ Comment on the use of IWBs for differentiation generally may indicate that this technology is not associated with the differentiation of teaching and learning resources.

6.7 IWB operation and features

The combination of hardware and IWB-specific software, allows the IWB to be operated as a piece of touchscreen, presentational technology. This theme explores the teachers’ observations on specific touchscreen and presentational operations and capabilities of the technology. This will include considering specific ENF software tools (e.g. the 'reveal' tool) as well as capabilities allowed by the hardware (e.g. showing DVDs). The operational limitations of the technology, as perceived by the teachers, will also be examined. The data has been collated under three sub-themes:

- Software tools and peripherals
- IWB capability
- Operational issues

6.7.1 Software tools and peripherals

ENF software provides users with specific tools including writing and highlighting tools, and tools for emphasising or hiding the screen content. All of the teachers in the study gave some consideration to such tools. Four of the teachers talked about using the 'reveal' or 'screen shade' feature. Abigail sees this as a ‘quite basic’ feature of the IWB. It allows all or part of the display to be obscured so that the content of the screen can be revealed as the user draws the 'blind' back from the screen. It can be used to reveal a text gradually. Deborah states ‘If I think there's a lot [of text] on I use the screen shade - to cover up bits at a time.’ She uses this tool as a means of managing the presentation of the content.

The 'reveal' tool is the most widely mentioned feature. Other tools are mentioned but each one is considered by only one or two teachers. The 'spotlight' totally or partially obscures most of the screen, leaving only a small area or spotlight where the content
of the screen can be clearly seen. The size and shape of the spotlight can be altered and it can be moved around the screen so that the subject of focus changes. ‘...it’s just a light you can shine on particular parts of the text’ (Abigail). This metaphorical light illuminates a small part of the screen. Both Abigail and Cherry use this spotlight to direct attention to a particular part of a text.

Other tools are also used by individual teachers to highlight content. Abigail describes using the highlighting pen: ‘We've been looking with year 10 at some past exam papers and looking at the unseen prose and we've been highlighting together texts on the board.’ Beverley and Bill talk about enlarging text in order to emphasise parts of the text: ‘...if the kids can see the words moving and getting bigger then their attention will immediately go to that bit’ (Bill). Cherry uses the tickertape tool, which allows small sections of text (for example, objectives) to scroll across the screen at a pre-set rate.

Some of the teachers describe using ENF software to manage the viewing of the screen. For example, Beverley ‘freezes’ the screen so the teacher can annotate a text and Deborah describes using 'dual page view' on Smart Notebook, which allows her to display two pages at the same time. She uses one screen to display a text and the other screen to demonstrate her point.

There are peripheral devices that can be used with an IWB, some designed for the purpose, such as voting devices, and some more generic devices that can be used without an IWB but can be linked up to them, e.g. a camera. Only Abigail and Alice mentioned using peripheral devices. They both have access to visualisers which are cameras that capture images that can be displayed on the IWB. Abigail describes how she uses the visualiser:

...so I can pull that [the visualiser] over - get the student's work underneath it very quickly - I can either take a picture of it and send it into your flipchart - within minutes - it doesn't take much - or I can just leave it under there and you can annotate a student's work together. That's really really effective.
Abigail is particularly impressed by the speed of use and sees this as a positive aspect of the other peripheral she uses:

*I've got little cameras - the little Busbies - and I've used them so much. For speaking and listening they are an absolute godsend - and again - plug them in and very quickly you've got the students' work - the actual speaking - on the board - to show the class and to show themselves.*

These peripheral devices are regarded positively by Alice and Abigail, but peripherals are not used widely by the sample teachers.

### 6.7.2 IWB capability

As well as specific tools and peripherals that can be used with an IWB, other more generic digital capabilities are mentioned by some of the teachers in the study.

Beverley and Bryn refer to the memory capacity of the IWB in that it can take ‘photos’ (Beverley) or ‘snapshots’ (Bryn) of the content. In fact there is a camera tool on the ENF software, but both of these teachers are referring to the capacity of the IWB to save documents. Work saved can be returned to at a later time ‘...so if I was developing this in another lesson - I could go back to this then - whereas if I'd written it on a normal whiteboard I'd lose it’ (Beverley). Bryn concurs: ‘...saving this into my documents with annotation is something that I've done regularly.’ These teachers value the capacity of the IWB to store annotated texts. Deborah takes this capability one step further: ‘The paragraph you saw me writing I printed off for them the next lesson and got them to edit it.’ In saving and printing off the work, she puts the content into the hands of the students to extend the work done on it.

Alice and Abigail both utilise the IWB’s capacity to hyperlink to files. ‘I like to use a lot of links - of hyperlinks in there to either my files or to the Internet - so I've got random name generators that are linked to the Internet which I can put into my slide and randomly go to very quickly.’ (Abigail) Alice also creates links to files: ‘If I'm looking at a YouTube clip or I've got a clip that I've brought in myself - I'll hyperlink it to an image - click on that and it automatically brings it up.’ Speed and fluency of use are important to both teachers.
Alice states that she uses YouTube clips, and two other teachers talk about using video in their teaching. Bryn says that he uses it ‘regularly’ for showing video, and Deborah likes the large screen for displaying video: ‘I will only run it on the board because it's a much larger screen than the televisions that we've got.’

### 6.7.3 Operational issues

Some of the teachers draw attention to operational issues. Beverley and Deborah both describe the difficulty of writing neatly on the IWB. ‘It does make a mess of your handwriting’ Beverley states, and she indicates a possible reason: ‘...it's difficult sometimes with the pens - you're putting it in one spot but the word is appearing in another spot.’ She is referring to the need to reconfigure or orient the board so that the point of pen/stylus is aligned to the writing point on the screen. This is part of the set-up process, and Beverley realises the process is needed but is unaware of how to do it. Deborah also considers that her handwriting is not as neat on an IWB as on a traditional whiteboard as she cannot rest her hand on the IWB as she writes. She asserts that practice and technique are needed: ‘... the more you practise with the board the better your handwriting is - and it is a case of calming yourself down and not scribbling across it.’ Deborah recognises if the writing process is not fluent, it may cause a real impediment to using the IWB and advises student teachers to practise as she sees it as a crucial skill. Bill also perceives problems related to writing on IWBs. He expresses frustration at only having four pen colours to choose from and irritation when the pen/stylus for the IWB goes missing.

A further problem, identified by Deborah, is gaining access to some websites, such as YouTube which are blocked by the schools, so she has had to gain technical help. Access to the ENF software itself is another issue noted by Cherry who doesn't have access to the ENF software for working on at home.

### 6.8 Student use

The teacher interviews mainly focused on the teachers’ use of IWB in their teaching, but there was some consideration of how IWBs were also used by students in their classes. Comments on student use are considered through these sub-themes:
- English skill areas: reading, speaking and listening, writing
- Knowledge and attitude
- Limitations.

6.8.1 English skill areas: reading, speaking and listening, writing

Three teachers - Alice, Bill and Bryn - talked about employing tasks which encourage students to use the IWB for practising reading skills. When describing a starter activity in which students have to read a statement and decide if it is true or false, Alice values the fact that the students go up to the IWB and work things out for themselves: ‘...it works really well with the kids because they think it's great that things can be hidden and then that means that they're finding the correct answer.’ An independent approach is being promoted.

Bill was probably the teacher who was most overtly enthusiastic about encouraging students to use the IWB: ‘I like them interacting with it themselves.’ For Bill, physical interaction supports engagement with texts. Like Alice, he sees the benefit of using the IWB to build students' confidence. Their approaches incorporate elements of self-assessment for the students as the teacher assesses how well they tackle the work on the board.

Bill feels that an active, competitive element adds an appealing element to lessons and he likes to use games on the IWB: ‘It's the idea that it's something different - it's the idea of competition - it's the idea that the kids themselves come up and touch the board.’ Bill sees games as a way to promote active engagement as opposed to a passive acceptance.

Bryn also sees value in using games on the IWB, citing a Year 9 lesson: ‘We were working on a scheme of work to do with travel so there were certain games we played - we had to locate different countries and things like that and it was over to the kids to do that entirely.’ Not only is Bryn keen to use games to support reading and engagement, but he also uses the IWB as a catalyst for allowing students to take the lead within a lesson.
Bryn is the only teacher in the study to comment explicitly on the use of the IWB for speaking and listening activities. He encouraged the use PowerPoint in a Year 11 lesson ‘to structure their presentations’. The students were asked to produce six slides to support their presentation, with the content of the slides being entirely down to the students themselves. Again, the IWB is used to support student independence.

Four of the teachers (Abigail, Bill, Cherry and Deborah) make explicit points about students themselves using the IWB for writing skills. Many of Bill's comments about students using the IWB express a general idea of how the IWB engages students, but he does specifically mention the value of having students working on annotation on the IWB: ‘... if they can come up and draw on the board they can draw on their own sheet.’ In other words, shared work at the IWB gives them the skills and confidence to work independently.

Abigail facilitates students writing on the IWB by providing specific spaces for their responses (Figure 6.2). This provides a visual aid for them on where to write but also gives them ‘their own space’. This public sharing of each other's ideas is important to Cherry too as she sees the value in having students write down their ideas, so that the rest of the class take notice. She does not take this approach in all lessons ‘...but it is something that we do use every now and again’.

![Figure 6.2: A framework provided by Abigail for student responses](image-url)
Deborah allows the students to use the IWB ‘occasionally’, but she feels protective towards her IWB. ‘I’m a little bit precious about my board.’ When she does allow them to use it, this would tend to be for specific tasks such as writing a class poem. Deborah avoids having students routinely writing on the IWB, and uses such occasions for specific group writing tasks. She sees the loss of pace in a lesson when students come up to the board as an issue: ‘They just take a really long time to write on the board – and that’s the only problem – if you want to get them all up – it slows the pace of the lesson down.’ (Deborah)

Each of the teachers talked about students using the IWB at some point in their lessons, although there is a sense from the interviews that the students' use of the IWB in some teacher's lessons is more frequent and routine than with the other teachers. Bill's language is enthusiastic and affirmative about students using the IWB: ‘I like the pupils getting out of their seats - I like them touching the board.’ Both Bill and Alice see distinct pedagogical advantages to having students use the IWB and being able to assess understanding immediately. Bryn presents a picture of routine student use of the IWB and Abigail also shows a readiness to involve the students at the board. With Cherry and Deborah, student involvement is a more prepared and occasional occurrence.

6.8.2 Knowledge and attitude

The student experience of IWB is not within the scope of this study, but it is possible to sense indications of their experience of IWBs through the words of their teachers. Both Beverley and Deborah refer to the students' knowledge of IWBs. Beverley admits that she is unsure of how to 'orient' the IWB (so that the pen and screen are synchronised): ‘You have to reconfigure the board or something - which I don't know how to do. Strangely the children know how to do it.’ Her wry observation is echoed by Deborah: ‘Sometimes the kids will tell you stuff - that they've seen other teachers doing - such as the one where you - if you've got the rubber you draw the circle round and stab it in the middle and all the writing disappears that's within your circle.’ Intriguingly, both of these examples reveal the students accumulated knowledge of IWB use, and their role in the transmission of practice within the school.
Student attitudes to IWBs are generally perceived as positive by the teachers. Alice states that certain IWB activities help them enjoy ‘a sense of achievement’. Abigail finds ‘the students here do like to come up when they’re given the opportunity’. She states that even where pupils appear to be not so confident ‘they’ll still go up’. Confidence is a quality referred to by Cherry. She considers certain factors that affect students’ attitude to using the IWB themselves, including age/key stage. For example, year 7 pupils ‘I seem much more willing to use the interactive whiteboard’. Cherry ascribes this to their relatively recent experience of using them more frequently in primary school, ‘...whereas if we go up a key stage they seem a little more kind of resistant to it in some ways.’ This possible resistance Cherry considers this may be due to unfamiliarity with using the equipment or feeling uncomfortable in being observed by their peers. Cherry also considers that gender may be a factor: ‘I get a lot of boys that like to use it – perhaps more so than the girls’. This study presents a mixed picture of student engagement, although generally a positive one.

6.8.3 Limitations

Two teachers raise the same limiting factor relating to student use of the IWB: time. Abigail reveals that time is a consideration on whether she asks students up to the board, implying that students are more time-consuming than teachers working at the IWB. Deborah concurs. ‘They [pupils] just take a really long time to write on the board – and that’s the only problem – if you want to get them all up – it slows the pace of the lesson down – they don’t write as quick as I do because they’re not used to it.’ Here, Deborah is more specific. It is the process of writing on the board that slows students down. Even though, as noted above, some students appear knowledgeable about IWBs, they are not skilled at writing on the board. Teachers seeking to maintain the pace of their lessons, are unwilling to let students use the IWB, and therefore students remain unpractised.

These glimpses into students’ responses to IWBs raise interesting questions, such as the level of secondary teachers’ knowledge of IWB use in primary schools, whether there are gendered responses to IWB use and how student use might be supported.
Such questions, whilst beyond the scope of this study (which is focused on teacher use), indicate possible areas for further research.

6.9 Training

Studies focusing on training teachers to use IWBs raise certain observations and recommendations. Amongst the requirements noted are: the need for good quality training (Kitchen, Finch and Sinclair, 2007; Moss et al., 2007); that training needs to address the differing demands of teaching with an IWB, both technical and pedagogical (Miller and Glover, 2007) and that training should be ongoing (Hall and Higgins 2005). The training experiences of the case study teachers are examined within this study, as a lack of training can impede progress (Smith et al., 2005). The data gave rise to the following sub-themes:

- official and school training received
- training needs and constraints
- training source: self
- training source: other teachers
- training source: external

6.9.1 Official training and school training received

The teachers’ responses to questioning about the official training they have received show that they fall into three main groups.

1. Training was received when IWBs were installed (Bryn and Deborah)
2. Received training only as a trainee teacher (Alice and Cherry)
3. No official training received (Abigail, Beverley and Bill)

Five of the teachers have received no official training from their school. The training input from schools, where it exists, is confined to the introduction of the IWB with no evidence of continuing professional development (by the school or an external agency) in IWB use for either individuals or departments for any of the teachers.
6.9.2 Training needs and constraints

The dearth of official training, noted above, must constitute a significant constraint on the teachers’ development in this area. Abigail is conscious of both a personal need and a department need for progression: 'I think we’re not making the most of it. Even in our department - even myself - I still feel there's a lot more I can do with it.' The repeated use of 'even' suggests that Abigail and her department are already significant users of the technology. Bryn recognises the need to keep pace with the technology: ‘... a lot of things have changed now with these new boards - with a lot more applications and the software that comes with the board for instance... So I just feel that maybe we could do with some more on that.’

Deborah identifies a particular need for subject-focused training. Recalling her initial training, she compares training for other subjects with that for English, and remembers feeling ‘They've got all the whizz bang things - where’s all my whizz bang things?’ Her training left her with the deflated conclusion that 'I could write words'. It did not provide input on how to use the IWB for English. Deborah also notes a specific training need relating to writing on boards: handwriting. Illegibility and lack of fluency are impediments that need to be overcome.

Another constraint, raised by four of the case study teachers, is time to develop IWB skills. Bryn wistfully explains that it 'isn't the ideal scenario when you've got a classroom of kids but you know at lunchtimes I'll try things out and after school I'll try a few things'. Cherry also recognises the significance of time: '...if I had time to sit down and really play with the whiteboard myself I'd probably...unpick some brilliant things to do'. Like Abigail, Cherry sees untapped potential in the technology. These teachers see time as affecting their personal development of skills, but Abigail sees a wider problem in that some of her English colleagues do not use an IWB at all: 'they find it time-consuming so then they’re not going to - because they've got a hundred other things to do'. Time-constraints prevent some from ever starting to use an IWB.

6.9.3 Training source: self

All of the teachers interviewed indicated that they were mainly self-taught: 'teachers teach themselves' stated Beverley, whilst Alice and Bryn stated their learning strategy...
was 'trial and error'. Bill learned from the Internet, and from another family member who is a primary school teacher. The teachers themselves are the source of their own development.

6.9.4 Training source: other teachers

In addition to being self-taught, a number of other factors have influenced the teachers' skills acquisition. Both of the Amberton teachers, Abigail and Alice, cited an inspirational and knowledgeable teacher that used to be in the department. This teacher fulfils the 'missioner' role identified by Glover and Miller (2001a) as an enthusiastic and competent exponent of the technology. This other teacher informally provided an introduction to the basics for Alice as well as providing impetus for 'more in-department work' (Abigail). Bill and Bryn, from Brightley, also specify colleagues as being influential. However, whilst such exchanges are appreciated, it is not perceived as training. Asked about whether he uses the ENF program, Bryn reveals: 'Bill shows me things here and there but I feel it's something I need more training on really.' Sharing ideas with a colleague is not a substitute for training.

Both Cherry and Deborah describe acquiring ideas from other colleagues across the school, Cherry through observing in a maths lesson and Deborah through seeing colleagues' resources and picking up ideas when 'wandering into people's rooms for a natter'.

6.9.5 Training source: external providers

Apart from the two teachers who mentioned training with the installation of IWBs, there was no evidence of the teachers attending training by an external training provider.

6.10 Concluding comments

The teacher interviews provide a rich source of data, which helps to illuminate both the individual contexts of the teachers and also their patterns of experience and practice in using IWBs. These patterns demonstrate areas both distinctive features as
well as areas of convergence in the teachers’ experiences. The thematic framework used to analyse the data has enabled the researcher to examine a diverse but pertinent range of areas, whilst ensuring that knowledge and practice of all of the case study teachers are reflected in the analysis.

In the next chapter, this method will be considered in conjunction with the other two methods used within this study. In keeping with the conception of Teddlie and Tashakkori (2006) on mixed methods research, the discussion chapter will integrate the findings from the three methods, with the aim of providing an enlightening response to the research question.
7 DISCUSSION

7.1 Introduction

In his Foreword to one of the first books devoted to collating research on IWB use in education, Mercer describes the unfocused introduction of IWBs into UK schools which began ‘without a clear conception of what teachers would make of them and how their use could help good practice’ (2010, p. xv). Despite this inauspicious start, he asserts that UWBs are potentially very useful but the relationship between the technology and pedagogy must be better understood. This present study aims to contribute to an understanding of IWB use within a specific secondary school subject area: English. Discerning the potential value of IWBs to English teaching and learning requires understanding of their current use. This study uses case studies of IWB in use in English to initiate an appreciation of the relationship between the technology and the pedagogy of English.

The introduction of the technology described by Mercer, was accompanied by an anticipated transformation of teaching and learning, particularly by policy-makers (Gillen et al., 2007). IWBs started to appear in schools at the same time as the introduction of the National Strategies (1998-2011) was bringing significant change into schools. Government initiatives provided a focus on pedagogy. Specifically within English teaching, the National Literacy Strategy (DFEE, 1998) and the Key Stage 3 National Strategy Framework for Teaching English (DFEE, 2001) brought about an emphasis on whole-class teaching and on shared learning strategies such as modelling. The introduction of IWB technology, coming as it did at the same time as other government-promoted and funded developments, might be expected to support the call for ‘whole-class interactive teaching methods’ espoused by the National Strategies (DFEE, 2001, p. 22), and the heavy investment in IWB technology by the government would seem to support this view.

However, technology must become understood, accepted and embedded if it is to have impact within the classroom. Bax sees this process as ‘normalisation’ (2010, p. 264) which is a gradual, complex and often reiterative process, achieved when the technology ‘is invisible, used automatically and without our being consciously aware of its role’ (2010, p. 266). The fieldwork for this study took place in 2011 when IWBs had been available for over ten years (although not in all schools) and this study considers what IWB normalisation in English looks like for the case study teachers. It considers the practice of teachers who were identified as regular and frequent users of IWB technology. Through a mixed methods approach, it
considers how these teachers have decided to make use of IWB for the teaching of English, and how they have adopted the technology into their pedagogy. It explores evidence of the teachers’ growing awareness of what the technology may have to offer English teaching and learning.

Revisiting the research question, at this stage, provides a reminder of the key areas chosen for focus.

*How, in terms of user, timing, content and purpose, are IWBs being utilised by a small number of secondary English teachers who are experienced in using the technology?*

The question raises four key areas for consideration: user, timing, content and purpose. This discussion chapter, therefore, will take each of these issues in turn, and will consider how the data gathered helps to provide an understanding of the impact IWBs may be having on the pedagogy and practice of the teachers in the sample. The discussion will be referenced to the body of thought and evidence encapsulated within the review of literature (Chapter 2), and it will also integrate analysis of the data from the different methods. Finally, the chapter will consider the professional knowledge and development of teachers in the study.

### 7.2 The users of IWBs in English teaching

The user of an IWB influences how the board is used. Schmid (2006) recognises this within her study investigating IWB use with adult English language students. In particular, she notes the teacher’s preference for traditional classroom strategies, involving group and paired work, and contrasts this with the students who ‘would move back and forth from the interactive whiteboard to their desks, and use the whiteboard to share their knowledge with the whole group or to play the teacher’s role’ (Schmid, 2006, p.56). Schmid contrasts the teacher’s traditional approach with the students’ use of technology to ‘transform’ the language classroom (Schmid, 2006, p.57). Using technology to support traditional methods cannot be considered transformational (Gillen et al., 2007) but using technology for ‘genuine interaction’ and the active engagement of learners in the construction of knowledge can contribute to the transformation of learning (Burden, 2002, p.9). It is the users that bring about the transformation. Consequently, examining the users of IWBs provides insight into whether the technology is supporting traditional or transformational models of working within the observed lessons.
7.2.1 Teacher attitudes

"The board’s my baby,’ Deborah laughs. Her amusement reveals that she knows this is an irrational or exaggerated statement about the inanimate screen at the front of her classroom but she is expressing her protective feelings towards 'her' IWB. She has taken 'ownership' of this technology. Deborah is perhaps the most explicit of the seven teachers in her approbation for IWBs but the interviews reveal that all of the teachers value IWBs. Bryn even states that the availability of an IWB would be a factor in deciding whether to accept another job. In all cases, the use of the IWB has become an intrinsic part of their classroom practice.

Deborah's protectiveness and her admission 'I don't like them [the pupils] touching it’, helps to explain why she is the predominant user of the IWB in her classroom. Her monopoly of IWB use is replicated in many of the other teachers' lessons. There is some pupil use in seven of the sixteen lessons observed but, except for one lesson, the teacher is always the main user of the IWB. Teacher use accounts for 80% of the use of the IWB. Within this study, the IWB is predominantly a teacher-led and teacher-handled piece of technology. The transformational use associated with learner use is not strongly evidenced within the observed lessons.

7.2.2 Student use and attitudes

Pockets of student use were observed in the lessons of five of the seven teachers, revealing that student use of IWBs is an established but limited part of IWB practice within the lessons of most of the study teachers. In most cases, students use the IWB to complete specific tasks, for example, participating in a game or writing a sentence on the board as part of a plenary task. Student use of the IWB within this study is usually subject to a high degree of direction by the teacher.

Proportionally, when they use the IWB, students are more likely to use the board for actually writing (handwriting) on the IWB than their teachers. However the nature of this activity is a factor limiting student use of the IWB. Because they use the IWB infrequently, their handwriting can seem slow and pedestrian: ‘They just take a really long time to write on the board’ (Deborah). Consequently, they were invited to use the IWB quite infrequently during the course of lessons.

The students themselves appear to show enthusiasm for using the IWB. Four of the teachers ascribe positive reactions by students to using the IWB. Some of the teachers also see benefits in the pupils' use of the IWB. It is seen as supporting engagement, for example, through competitive tasks and games. Abigail and Bill both see the public sharing of information as
helpful in the assessment process, as pupils display their ideas on the IWB and the teacher assesses their understanding. Within this study, when pupils do come to the board, it is usually on their own. The systematic lesson observation data notes only one occasion when two or more pupils worked together on an IWB. The IWB is not used as a place for students to work collaboratively; rather, pupils are invited individually, one at a time, to complete discrete tasks. Apart from the speaking and listening presentations given in one of Bryn's lessons, there is a sense of constraint and limitation in the pupils' use of the IWB. It is a carefully managed process, with concrete, directed tasks.

User confidence is an issue raised by Abigail and Cherry. Abigail thinks that even less confident pupils like to use the IWB. Cherry considers that the two main factors that affect confidence are age and gender, with younger pupils and boys in general being more willing to use the IWB. She feels that younger pupils, who have had recent experience in using them at primary school, are more amenable to using them in year 7. This is an interesting observation, revealing Cherry's assumptions about a higher (and possibly more interactive) level of use at primary school. Understanding the type of use at different phases of education, and the progression between school phases might provide an illuminating focus for further research and study.

7.2.3 Control

The greatest proportion of pupil IWB use was noted in one of Bryn's lessons where students were giving speaking and listening presentations as part of their GCSE assessed work. Student use of the IWB was less directed than in the other observed lessons. The only guidance that they were given was to produce six slides to support their talk, meaning that the content 'was entirely down to them' (Bryn). Describing the nature of IWB work done with a previous class, he states that he allowed the pupils to deal with the content and tasks: 'It was over to the kids to do that entirely so I take a total backwards step on that.' Bryn uses the IWB as a catalyst to pass control to the pupils.

It might appear that the decision on whether to allow pupils to use the IWB is merely one of personal style or preference in a teacher's practice. However, the example of Bryn's practice above is revealing. The IWB and, more particularly, the operation of the IWB appear to be associated with the control of the lesson. This concept of control extends to two particular areas. Firstly, it refers to classroom management. This is concerned with the creation of an effective learning environment within a lesson, which engages the pupils and reduces the likelihood of disruption. Bryn refers to this type of control when he describes using the IWB
‘to regain the focus on the group’. The second area of control might be thought of as pedagogical control. Deborah does not want to invite pupils up to use the IWB because doing so leads to a loss of pace which is important to her pedagogical approach.

The notion of control is raised in another study, examining IWB use within modern foreign languages classrooms, where the IWB was noted as ‘a tool for increasing control over pupil behaviour and learning rather than for opening up the classroom to the outside world or for increasing pupil autonomy’ (Gray, 2010, p. 80). It seems that the IWB can be viewed a highly visible signal and tool of power and management, rather than as a resource for transforming learning.

Within this study of IWB use in English teaching, Bryn is unusual when he describes allowing pupils more freedom in the operation of the IWB. The more usual model is for teachers to grant pupils very limited access to the IWB. The constrained nature of pupils’ access to the IWB means that the teachers remain firmly in control and the IWB reinforces the teachers’ status and control within the lesson.

7.2.4 Developing student use

Despite predominant teacher use of the IWB, four of the seven teachers refer to the benefits of having students working up at the board; working at the board is associated with interactivity. Bill is particularly keen to have students using the board: ‘there’s a lot to be said for pupils getting up and touching the board and interacting.’ He acknowledges different types of interactivity and that interaction with ideas can take place with the students seated but states that working at the board is important: ‘it’s about engaging interaction rather than passive interaction – active interaction.’ He sees pupil operation of the IWB as an important part of the interactivity.

Greater pupil use of the IWB would significantly change current practice. It would require teachers to consciously plan for student use of the board, and to consider different ways of working, for example, students taking on a teaching role or the use of the IWB to support enquiry-based learning for groups of students. Such changes would also necessitate the ‘upskilling’ of students. Learners who are trained in the practicalities of using IWBs may be less likely to impede the flow and the pace of the lesson. Students who have had time to practise writing on the IWB may feel more confident in contributing to the learning by adding their own notes to the board. As in Schmid’s (2006) example in Chapter 7.2 above, where learners use the IWB differently from their teacher, pupils who are given access to the IWB
with appropriate training, might facilitate explorations of texts and issues, which go beyond the showing of text and images on a PowerPoint. This is a further valuable area of future study, although beyond the remit of this present project.

7.3 A consideration of when IWBs are used in English lessons

Bryn deems IWB use as appropriate in any part of his lessons: ‘Anywhere really – starter - mini-starter - plenary - mini-plenary – anywhere in a lesson.’ During his interview, he indicates when he uses his IWB both in terms of the timing of his lesson (for example, at the start of a lesson) and the stage in the teaching (for example, for reviewing learning). He appreciates how the IWB can help to structure and add pace to his lessons.

Considering when an IWB is being used in a lesson helps in understanding how they are being used by a teacher, as it reveals where the teacher feels that IWB use is appropriate. This section will consider when IWBs are used, both in terms of the timing/chronology of the lesson and also in terms of the stage of teaching/learning within the learning sequence.

7.3.1 The timing of IWB use in a lesson

Evidence suggests that where they are installed, IWBs are being used by teachers. Between the first Evaluation of the Curriculum Online survey in 2002 and the third survey in 2005, the proportion of respondents using IWBs in at least half of their lessons rose from 5% to 42% (Kitchen, Mackenzie, Butt and Finch, 2006). Commenting on an evaluation of IWB use in selected London secondary schools, Moss and Jewitt note that IWBs ‘were rarely totally ignored’ (2010, p.31).

Within this present study, data from the classroom observations revealed that the IWB could be found in one of the following states:

a) the main focus of teaching
b) on, with relevant content displayed, but in background
c) on, but not in use

The majority of the observations showed that the IWB was either the main focus of the teaching (44%) or was displaying relevant materials in the background (51%). Whilst higher than usual use might be expected when lessons are being observed specifically for IWB use, it is significant that the IWB was always observed as ‘on’ in the observed lessons, and usually showing material relevant to the lesson. This suggests a piece of technology which has
become an established and standard part of each teacher's approach and of the routines established within each lesson.

The IWB was often the main focus of teaching attention within the first part of lessons. Fifty-four percent of the observations showing the IWB as the main focus of the lesson are from the first twenty minutes of the lesson. In the middle and end sections of the lessons, the IWB is more likely to be on in the background than to be the main focus for the teaching. This suggests that the IWB is being used by the case study teachers as the focal point for the first part of the lesson. This opening content is fully prepared (there were no incidences noted of the material on the IWB being created during the first twenty minutes of the lesson) and typical focuses included displaying learning objectives, presenting starters and introducing relevant materials for the lesson. This approach suggests a highly prepared and organised approach to the delivery of the first part of the lesson.

Moss and Jewitt (2010) consider the preparation of texts for IWBs by contrasting two different pedagogical approaches, which may be characterised as old and new. The old approach has the teacher writing down key points from the discussion before erasing the board. They note the benefits of this old approach as making the talk visible, ‘crystallising what otherwise would remain transient’ (Moss and Jewitt, 2010, p.30). The new approach has the teacher preparing the key points on PowerPoint beforehand, prior to the learning interaction, a strategy which ‘presumes that everything of pedagogic interest can be determined ahead of the event’ (ibid.). They liken this new approach to working through a text book. Their examples illustrate that ‘what makes good pedagogy’ (ibid.) with IWB use is complex and may involve ‘doing what one did before the new technology arrived as well as doing new things that the technology allows’ (ibid.).

In terms of this present study, the heaviest use of the IWB occurred in the first third of the lesson. It is probable that the teachers find it easier to plan for the early stages of a lesson, before the main learning events have occurred. In the first part of the lesson, the learning is being set up. The remaining two-thirds of the lesson are less easy to predict and prepare for and consequently, prepared IWB content is less frequent later in the lessons observed.

Examples of how the IWB is used at the start of the lesson are shown in Figures 7.1, 7.2 and 7.3, showing content from a lesson taught by Abigail. Figure 7.1 displays the date, the learning objective, the title and the learning outcomes which are copied by pupils at the lesson’s start. The teacher explains the learning outcomes. Figure 7.2 shows the initial activity for pupils to
complete. Figure 7.3 shows the next screen which provides students with the information that they need to complete the activity. On this example, the ‘blind’ feature is used to obscure some of the text.

![Figure 7.1: Example 1 of IWB content from the first part of a lesson](image1)

![Figure 7.2: Example 2 of IWB content from the first part of a lesson](image2)

![Figure 7.3: Example 3 of IWB content from the first part of a lesson](image3)
The screens present information and instructions. They are text-heavy. Apart from a little annotation on the screen 1, they are fully prepared. This is the approach described above by Moss and Jewitt as being textbook-like. However, there is an essential difference between this use and the traditional textbook approach. The traditional textbook is designed for general use, and not for use with a specific department or class. The content of the screens in Figures 7.1, 7.2 and 7.3 has been designed by the teacher, specifically for her class. This is a significant development in classroom resources. It means that the content of the resource is dictated by the teacher rather than by a commercial publisher. The main focus of the learning, therefore, should be exactly where the teacher requires it to be, rather than where a commercial publisher assumes it should be. The IWB content provides a visual reinforcement of the teacher’s message and spoken instructions.

In theory, this means that the resource allows a greater degree of personalisation for this class, in terms of areas such as language and vocabulary, the scope and choice of the tasks, and the level of challenge. Even with a resource that has been created for departmental use, there should be greater flexibility than with a traditional textbook because it is a digital resource and can be adapted easily by the teacher.

Of course, the quality of what is presented is totally dependent on the individual teacher. The traditional textbook, produced by an established publisher, is the product of a process of planning, design, writing, redrafting, editing, proofreading, etc. The resources created by teachers for their lessons, day-to-day, do not have these safeguards in place, and there may be issues here, for inexperienced teachers, for example, or problems related to design issues. However, there is an inherent flexibility in teachers creating digital IWB resources for their own context and their own classes which provides a significant asset to both teacher and department.

A further possible benefit is that working with prepared resources enables the teacher to spend time addressing the class, talking through the information, sharing ideas and checking understanding rather than writing on the board. The effect of using prepared materials may be one of injecting pace at the start of the lesson, although other studies have also noted there is a concomitant danger of not allowing reflection time when using prepared resources (Moss et al., 2007; Smith, Hardman and Higgins, 2006).

7.3.2 Spontaneous use of IWBs
The use of the IWB by the sample teachers is characterised by heavy preparation. It is employed as a classroom tool that uses prepared materials and not as a place to create
materials during the lesson. Within this study, the IWB is not strongly associated with spontaneity. However, two examples of spontaneous use were noted during the lesson observations. Whilst teaching about the historical context of *Of Mice and Men*, Bryn used a short extract of a DVD of *The Great Gatsby* to illustrate historical context points. Once he had found the appropriate part of the film, he showed it twice and talked through its relevance. The use of the video enabled the students to visualise, with more clarity, the historical setting and cultural context of the novel they were reading.

Cherry also introduced unplanned materials into a year 10 poetry lesson to help students ‘access the task’. She found photographs of work done in a previous lesson, embedded in a PowerPoint, and displayed them on the board. Having stopped the class for one minute to talk through the examples, Cherry reverted back to her planned work, but by showing her class the examples of previous work on the topic the students were possibly able to better appreciate the learning outcome from the lesson.

In both cases, the teachers were able to ‘read’ the class’s need and respond to it. The unplanned intervention was swift and brief, and so did not interfere in any significant way with the flow of the prepared lesson. The process was facilitated by the resources being available to the teachers in a digital format. The teachers also needed to have a good knowledge of the resources available, and the confidence to introduce them using the technology of the IWB.

No examples were noted of teachers spontaneously creating a resource (e.g. a page of notes) whilst exploring issues or ideas. Interestingly, Bryn unequivocally praises IWBs for their ability to support unplanned teaching – ‘...it’s a Godsend for that’ – and reveals he considers this to be a common aspect of his teaching, but unplanned use of IWBs was rarely seen in the observed lessons. A contributory factor may be that the lessons were observed by the researcher, and therefore the teacher may be less likely to divert from the planned lesson. However, the tendency to use planned and prepared resources is very strong within the study, and would seem to indicate that this is a significant factor in using IWBs with most of the study’s teachers. The IWB is used to display and broadcast prepared materials. It is not generally utilised as a site for developing new ideas and resources. In other words, the IWB is concerned with a pedagogy that centres on the presentation and transmission of prepared ideas, as opposed to an approach that might be typified as constructivist where ideas are shared, considered and developed as a joint process between teacher and learner. This is an observation which is reinforced by the fact that the learners took so little part in using the IWB, as noted in Chapter 7.2.2.
7.4 IWB content

The availability, multiplicity and flexibility of digital resources allow for a wide range of IWB content. Access to the Internet, to the range of digital resources that can be used on a computer and to the peripherals that are available for IWB use would seem to indicate a tremendous range of content for supporting English teaching. The findings here reveal that the teachers in the study are restrained in their choice and use of IWB content. The types and range of programs and applications used by the English teachers are limited. Examining the nature of this limited content helps to provide an understanding of how IWBs are regarded and used within the teaching of the sample teachers.

7.4.1 PowerPoint versus ENF

Of the nineteen possible types of content established for the content analysis, two predominate: PowerPoint and the electronic notebook/flipchart (ENF) programs. Most of the teachers use just one of these programs, which becomes the main vehicle for their content. Working with one core program may appear to be a sensible choice for busy and pressured teachers. However, are the teachers choosing between roughly comparable programs or are they making a choice which affects their options and capabilities in using the IWB? Before considering the content used by these core programs, it is illuminating to examine the nature of the programs and the possible implications of using just one core program.

At first sight, both ENF and PowerPoint appear to offer similar opportunities. Figures 7.4 and 7.5 demonstrate similar effects from both programs. Beverley and Deborah prepare a framework for their notes, and they fill in the notes during the course of the lesson. Figure 7.4 shows how Beverley uses PowerPoint, annotating a ‘spidergram’ with responses from the students. Deborah, in Figure 7.5, models a response for the students using ENF.

Figure 7.4: Beverley’s handwritten notes on PowerPoint slide
Either program could have been used for both tasks, and within the study there are many examples of both programs being used in similar ways.

However, there are significant differences with how these types of program operate. One writer states that PowerPoint presentations can be ‘too linear in their structure’ and advises spending time exploring the interactive capability of ENF which provides ‘the potential to be far more creative in your teaching than PowerPoint can’ (Braham, 2006, p.16). Braham does not see them as equivalent applications, offering similar opportunities. Instead he is clear that ENF programs hold distinct advantages over PowerPoint in terms of interaction and creativity in teaching. There are, indeed, specific differences between PowerPoint and ENF but it is too simplistic, however, to suggest that PowerPoint is linear whilst ENF programs are more interactive. Both programs can be used in a linear manner. Jewitt, Moss and Cardini note the ‘ease of movement between screens’ where PowerPoint or ENF presentations are pre-planned (2007, p. 311). The flow of materials so created can make for a fast pace whether it is PowerPoint or ENF that is used.

The programs have different affordances and therefore different potential uses within an English lesson. Understanding the affordances and constraints of the programs is essential if teachers are to make full and productive use of the programs in their teaching. PowerPoint, for example, uses the feature of ‘animation’ which enables words to appear (and disappear) in a predetermined order. Gradual revelation of a text, for example, may support the navigation of the text. Where the manipulation of text or images is required by the user of the IWB, for example hiding and revealing an item of content, an ENF program may be more suitable. An excellent example of this was observed in a year 7 lesson taught by Alice. In a lesson starter
focusing on the topic of identity, Alice asked students to come to the IWB and move prepared statements into ‘true’ or ‘false’ boxes (Figure 7.6). Using a ‘layered’ effect she had learned from a colleague, she designed the task so that the statements would only show if they were taken to the correct box.

The students had to read the statements and drag them to the right box. By allowing students to self-correct, she removes the fear of being wrong, and puts the emphasis on the discussion of abstract and demanding ideas. This is a sophisticated use of ICT to support learning. It is the affordances of ENF software, not PowerPoint, which allows her to create this resource.

A significant difference between the two programs centres on how they facilitate the use of written text. PowerPoint provides the user with standard frameworks for assembling content. Whilst designing ‘from scratch’ is a possibility, the program provides a range of design templates and options which encourage particular formats for the slides. The text box is a fundamental content element. With default fonts, sizes and bullet points, the text box provides a printed writing environment. Handwriting is possible on PowerPoint, but it is not presented as a standard way of adding content.

ENF programs, on the other hand, present a blank page accompanied by a range of content tools, including options for adding both printed text and handwritten text. A range of writing tools and highlighters feature as key tools. ENF programs also enable handwriting to be transformed to printed text. Within this study, annotation is just over twice more likely on ENF content than on PowerPoint. Whilst annotation may seem to replicate the 'old technology' of
writing on a traditional whiteboard, it is a feature of the classroom which can indicate support for pedagogic processes such as modelling, analysis of texts and recording a spontaneous response from pupils. Annotation is possible on PowerPoint (Figure 7.4) but is not promoted by the program in the same way.

Understanding the affordances of these core programs is essential if teachers are to use IWBs effectively. Understanding the programs themselves is also essential. Alice’s understanding of the ENF program was sophisticated but, as evidenced by the observed lessons, unusual. The teachers who used PowerPoint, for example, used limited features of the program in terms of animation, multimedia or hyperlinks for example. By using only one core program and a limited range of features within that program, the teachers are limiting the potential of the IWB to support teaching and learning. Even within the program that they do use, often the range of features used is limited.

Opportunities for evaluation and reflection on their use of the IWB appear to be rare. Ongoing training was non-existent with the sample teachers. If teachers are to design effective resources and teach successfully using IWBs, they need to understand the key programs together with their affordances and constraints. Time for training and development will be needed.

7.4.2 The written word

Seventy-four per cent of the observations made during the systematic classroom observations showed the sample teachers using written text only or a combination of written text and still images on their IWBs. Written text is the main element of their content. So gaining an understanding of how the English teachers approach the inclusion of written text within IWB content should help to provide insight into their use of IWBs.

Handwriting on IWBs

The predominance of printed writing over handwriting is clear. This study distinguishes between handwritten texts (i.e. complete texts, written ‘from scratch’), and annotations (words and/or marks over existing text). In the case of the former, only 5% of the written text used on the IWBs during the observed lessons was handwritten. There was no handwritten text observed from three of the case study teachers. When annotations are included, the figure rises to 17%. All of the teachers did some annotation but the proportion of handwriting and annotation done at the IWB is small and this marks a significant turnabout in presentation from traditional whiteboards where handwriting was the norm. The majority of the written
content displayed by the teachers in this study was presented as printed text. It indicates a change from using pens, to using a keyboard. Despite the provision of pens or a stylus with IWBs, the keyboard predominates.

Handwriting, when it did occur, was associated with ENF programs. Annotation was also more likely on ENF resources, which accounted for 68% of the annotation. Consequently, the tendency amongst the case study teachers to use either PowerPoint or ENF, noted above (Chapter 7.4.1), has a particular significance for the inclusion of handwriting on IWBs. If they opt for using PowerPoint to the exclusion of ENF, they are less likely to use handwriting. The result may be a diminution of the potential affordances of the IWB for the teacher.

The IWB, as a digital device, supports handwriting. Pens are provided and writing features (such as coloured ‘inks’ and varying pen thicknesses) are part of the ENF programs. Handwriting recognition features allow writing to be transformed into printed text. The user of an IWB ought to be able to customise their handwriting to produce a wide range of effects. There were very few incidences of these features used in the observed lessons.

Lack of familiarity with the ENF programs may be an issue, but there does seem to be one dominant issue: the success of handwriting. This refers to the ease, fluency and finished effect of the handwriting. Beverley’s damning conclusion is that the IWB ‘does make a mess of your handwriting’. There are a number of possible reasons for poor handwriting on the IWB, including the requirement for the IWB to be set up (oriented) accurately and the need to avoid leaning on the board as you write. Examples from the study show handwriting that appears large and somewhat unwieldy. Much of it is printed, indicating a lack of fluency. Deborah admits that one of the reasons for not asking the pupils up to the board to write is because they are slow and awkward in using the IWB. Some teachers do allow the students to write on the IWB but the results can be difficult to read (Figure 7.7).

When teachers are spending considerable amounts of time in producing highly-prepared, professional-looking resources, it is perhaps understandable that they are unwilling to allow

![Figure 7.7: Cherry’s Year 10 pupils writing lines of poetry on the IWB](image)
clumsy handwriting to spoil the effect, but is anything lost by having the use of printed text in place of handwritten text? Handwriting may be more appropriate for tasks involving spontaneous or real-time activities, or for tasks involving sharing and collaboration. In terms of English-specific activities, this might include modelling a process, or gathering thoughts and responses to a text. When the IWB is being used as a venue for the joint consideration of a text or task, and the teacher is eliciting a shared response from a class, handwritten notes may be a swift and appropriate way of capturing the discussion. The capacity of IWBs to create a saved record of class deliberations is a very powerful tool. However, there was no evidence in the observed lessons of teachers capturing and saving such explorations so that they could be revisited at a future date.

The unwillingness of teachers to use the IWB for handwriting, or for any sort of developed response using handwriting, may affect the thoroughness and the quality of the shared response with a class. Flexibility and spontaneity are likely to be associated more with handwriting than with printed text, and so the lack of handwriting may well affect the flexibility of responses within a lesson.

Deborah sees writing on the IWB as a skill of its own, that needs to be practised. However, even with this proviso, it would seem that manufacturers need to do more to make the use of handwriting on an IWB a more natural and user-friendly process. There needs to be an improvement in the quality of the handwriting applications of ENFs, so that handwriting should be another affordance of IWBs that supports collaboration, spontaneity and flexibility. If the IWB is to be the site which records and captures the development and progression of understanding and learning, then handwriting must be allowed to be a vital part of the process.

**The printed word**

The case study teachers presented text in different ways. However, one feature common to all of the teachers was a tendency to present written text in a printed or typed format. This reflected the high degree of preparation that characterised the IWB content. The inclusion of printed text requires design decisions to be made over aspects relating to the text, such as the amount of text, the size and the font (properly known as *typeface* but now commonly used, as here, synonymously with *font*). For the purposes of this study, certain design aspects were chosen as ‘markers’ of their design and decision making. These include font type, font size and the use of colour within written text.
One font was mentioned more than any other: Comic Sans. It was the font of choice for four of the seven teachers. Labelled as the ‘English Department font’ (Deborah), it was clearly seen as significant in terms of design of content. The only other named font was Arial. Comic Sans and Arial are both sans serif fonts and the teachers opted for them because they are perceived as clear or, in the case of Comic Sans, because it imitates handwritten characters. Both Cherry and Deborah identify the formation of the letters in Comic Sans as being helpful to students.

Evidence from research on the use of fonts in education is inconclusive. Teachers of beginning readers often have a strong preference for sans serif fonts such as Comic Sans as they are concerned about the appearance of particular ‘infant characters’ (characters designed for children which aim to imitate handwritten letters) such as ‘a’ and ‘g’ (Walker, 2005, p.5). However, researchers have established that there is a ‘human tolerance for typographic variation and the elasticity of the typographic system’ (Lupton, 2003, p.1). This tolerance extends to young children who cope well with a wide range of different letter forms (Coghill, 1980; Walker, 2005).

The teachers within this case study have been establishing for themselves principles of design. Such choices include size of the font: two of the teachers work to a particular size (one at 24, one at 26) whilst two others are conscious of the need for a large font, although they do not mention a particular size.

The teachers also considered colour within written texts. Three teachers (Abigail, Alice and Cherry) were concerned to produce colourful, stimulating screens of content, where the colour supported navigation of the content. For example, coloured text boxes indicated texts on different areas. Similarly, coloured font would indicate a rubric or significant piece of information. Colour and pictures were also used for more decorative effect too, providing a polished or professional effect.

The content from Beverley and Deborah was quite different being mostly black and white, and, for the most part, quite unadorned. Beverley revealed a pragmatic approach to focusing on content rather than presentation, but for Deborah working with black and white presentations was a deliberate attempt to provide consistency for dyslexic pupils by having the IWB the same as their paper and ink. The presentations created by these two teachers were marked by a plain, simple appearance, with little distraction from the words themselves.

The printed text of the five teachers who designed their own content fell into two groups:
1) Enhanced presentation: typical design elements include coloured font, coloured backgrounds, still images and/or animated images that are intended to adorn text rather than add meaning, sans serif fonts, large sized fonts

2) Plain presentation: typical design elements include black and white text and background, no added images unless an intrinsic part of the presentation, sans serif fonts, large sized fonts.

Despite this contrasting approach, observations of the content and interviews with the teachers revealed a considered approach to the presentation of printed text.

**House style**

Through their observed content, and the discussions of their rationales, the teachers in the case study display a readiness to engage with matters of design in their IWB content. Moss et al. (2007), in their study of practice in 2004-5, noted teachers struggling with the demands of clear, navigable design on their resources. Over five years later, and with IWBs and practice potentially more established within schools, this study reveals teachers who are conscious of design issues and are making considered decisions for the content they use on the IWB, albeit some more well defined than others.

The decisions made by the teachers have led to presentations following a particular pattern which might be considered a ‘house style’. The creation of a house style is deliberate in some cases. Alice, for example, creates sets of IWB resources which maintain a consistent design according to the unit. Others teachers were guided by broader design principles, such as Cherry’s decision to use particular fonts with Key Stage 3 pupils and other types of font with Key Stage 4. Each of the five teachers who have created their own resources has established a discernible house style or at least has considered principles of design.

**7.4.3. Multimedia tool?**

Mayer defines multimedia as ‘presenting both words (such as spoken text or printed text) and pictures (such as illustrations, photos, animation, or video)’ (2005, p.2). Such a definition allows for a very wide range of multimedia approaches involving both old and modern technologies. However, digital technologies ‘consisting of pictures (such as animation) and words (such as narration) - offer a potentially powerful venue for improving student understanding’ (Mayer and Moreno, 2002, p.107). The terminology here is significant; technology is described as an area or setting for learning to take place, with the focus being on the learning. It suggests that multimedia technology is more than a mere tool, and that it has the ‘power to facilitate learning’ (Moreno and Mayer, 1999, p.358). The IWB is a multimedia technology which offers a ‘potentially powerful venue' for learning. Considering the
multimedia uses of IWB use in the English classroom may enhance our understanding of the affordances of this technology.

**The cognitive theory of multimedia learning**

In his cognitive theory of multimedia learning (CTML), Mayer (2005, p.33) asserts that we have separate ‘dual channels’ for the cognitive processing of visual and auditory information. Pictorial and verbal information is gathered by our senses – eyes and ears – and this is then processed by our working memory (Figure 7.8). The working memory is limited and temporary, but to support the processing it can call on the long-term memory which can hold vast amounts of information. The aim of learning is to add to the long-term memory.

![Figure 7.8: The cognitive theory of multimedia learning (Mayer, 2005, p.37)](image)

Effective learning is not just the result of using both words and pictures. Rather, says Mayer, it comes about from the judicious selection and organisation of both types of input data. In other words, there needs to be a careful marrying or a conscious management of the resources to effect the learning. Consequently, this study looks for evidence of such management choices, or at least an awareness of the need to consider such factors as the types of media used on the IWB.

The tendency of the case study teachers to use written text on the IWB has already been noted. This study considers whether other forms of input are also used to support learning.

**Still images**

Figure 7.9 provides a reminder that the content shown on the IWBs in the observed lessons was generally quite limited and focused primarily on written text. However, there is also
substantial use of still images. Still images usually accompany written text. When written text is not used on its own, it is likely to be used with still images.

Figure 7.9: The number of counts of different types of content being used on the IWBs

This approach of combining written text and images is one which may well support learning. Mayer asserts that 'People can learn more deeply from words and pictures than from words alone' (2005, p.1). Of course this doesn't suggest that any pictures used in any way can support learning, and his definition of pictures does not just refer to still images. However, the rationale behind multimedia presentations is that using both words and pictures ‘takes full advantage of the full capacity for humans for processing information’ (Mayer, 2005, p.4).

Within this study, the teachers’ readiness to incorporate still images alongside written text suggests an acknowledgement, if not an acceptance, of the multimedia principle that pictures and words, as opposed to words alone, supports better learning.

Still images were a part of the content of all of the teachers. However, the images were utilised by the teachers in a variety of ways and for a range of different purposes. Examining some of these uses, reveals something of the variety and resourcefulness of the teachers’ approaches.
Still images to create house style: As has already been noted, images were used by two of the teachers to create a ‘house style’ to their presentations. In order to achieve this, they usually used repeated small images or motifs that appeared on each screen related to that topic. In the example given here (Figure 7.10), Alice uses coloured handprints as a motif for her presentations on the theme of identity. Figure 7.10 only shows part of the screen, but the handprint motif appears in each corner of the screen, framing the text within. The coloured handprints are a deliberate choice and carry subtleties of message that support Alice’s message. The handprint itself carries connotations of uniqueness, and the different colours of the three grouped handprints suggest both the individuality of the owners of the handprints as well as a sense of them being in a community. Such images are associated with children and early artistic expression. By using this image to frame her text, Alice is emphasising some of the concepts and ideas that she is hoping to explore with the lessons on identity.

The images used in her presentation create a house style for her teaching about identity. Alice considers this is useful part of her teaching strategy. Such pictures are not just there for decoration but they serve a definite purpose. In fact they are part of every scheme of work so ‘they know when they come into the class – that’s the scheme of work – they know when the scheme of work’s changed because the background changes’. Her rationale is that the presentation is helping to focus her students and marshal their expectations: ‘they can make a link like we’re looking at this today so what’s the learning objective going to be?’
Alice is using the visual cues not only to signal the theme of the lesson, and to link the content within one lesson, but she is also to providing a sense of coherence within the scheme of work over time. By ascribing a meaning to the images, and using the same images on the content related to a topic or theme, she provides a clear linking device between one lesson and the next. The images provide an immediate visual prompt for the pupils which would be more difficult to achieve with written text alone.

**Still images to frame a response:** Some of the teachers provided writing frameworks on the IWB to support student responses. Whereas other teachers were observed asking pupils to write on a blank or white screen, Abigail provided colourful frameworks for their responses (Figure 7.11). These frameworks were actually templates provided with the ENF software package. Abigail felt they successfully provided a platform for the students to share their ideas: ‘I think just having their own separate space – so it’s theirs – that’s one group’s – that’s another’s – that’s giving them their own space.’ Not only does the template provide an identifiable space for each group, it also enables them to view each other’s ideas more clearly. Abigail feels that the attractive framework used, supports and encourages students: ‘I’ve used this similar format with classes that I wouldn’t say are as confident – but they’ll still go up.’ The use of images and a framework helps to give them temporary ownership of part of the IWB. Within Abigail’s lesson, this strategy helps to stimulate a more collaborative use of the IWB and an environment where students are encouraged to share ideas and offer them for joint consideration by the class.

![Figure 7.11: A framework used by Abigail for student responses on the IWB](image-url)
Still images to model a response: Using images to provide a model of a required response was also observed. Cherry encouraged her year 10 students to engage with poetry by choosing some words of particular significance to them. At the start of the lesson, Cherry explored how a few words of poetry can hold meaning for an individual and provided the students with photographs of poetry tattoos. Challenging them to choose and explain some poetic words of significance for them individually, she gave the students the option of writing the words on their own arm. Cherry provides a model of her own choice, displaying an image of the ‘tattoo’ on her arm (Figure 7.12). The pen in the background indicates that this is a ‘drawn’ tattoo. Cherry intrigues the students with this image alone at first. She provides a clear model to follow. The device of the tattoo is a way to encourage students into the close reading of and engagement with a body of poetry. She uses the image to underline this device – by having the image appear on its own at first. Only once she has shown the image, does Cherry follow this up with text that emphasises the poetry and explains the line of poetry (Figure 7.12).

Figure 7.12: Cherry displays an image of a poetry ‘tattoo’

Figure 7.13: Other text is added to the image
Cherry uses her IWB to provide another model for her students. This is a photograph of some work of the same nature, done by a previous class (Figure 7.14). As she assesses the work of the students during the lesson, she realises some students are having some difficulty. To stimulate their ideas, she shows them this photograph. ‘I thought that if I showed them the examples from my other Year 10 class that they’d be able to access the task a little bit more’ (Cherry). Collecting digital images of work that students do is something that she has started to do in case it can provide a helpful model for other students.

Figure 7.14: Cherry shows examples of work from another class

Still images that help students to conceptualise: Still images were also utilised as the main focus for study. Whilst exploring An Inspector Calls with one of her classes, Beverley made use of still images of settings and characters from the play to enhance the students’ knowledge and understanding of the play. Figure 7.15 shows one example of such content. Apart from a slide title and a small annotation, the images are used on their own. Beverley wanted to help the students conceptualise the text as a play and something that is performed: ‘it was just to give them a sort of visual of the plays in performance – and also the concept that different people do it in different ways’ (Beverley).
Beverley uses the images to compare and contrast different interpretations of the play. The pictures are roughly of an equal size so that one picture does not predominant and there is a sense of a balanced design in the arrangement of the pictures on the slide. There is a short catchy title to the slide which sums up the content in the way that a headline might do.

Whilst there is very little written text on the slide, Beverley’s own verbal narration to the slides provided the necessary background to some of the images. The image annotated with an arrow indicated a performance that she had been to see at the theatre, and she related some details of her own personal experience of the play at the same time as showing these images. This multimedia approach, using both the pictorial and verbal – the visual and the auditory – helps the students to access the concepts of performance and interpretation related to the text they are reading in a book.

The use of images from five different performances helps the teacher to provide a breadth of consideration in a short period of time. The incorporation of images into lesson resources helps the teacher bring outside resources quickly into the classroom. By using the IWB, she is able to quickly point out relevant detail (note the small arrow annotation), and also draw attention to small details to the whole class at once.
Moving images

There were few observations of other multimedia resources. Three video excerpts were used. Beverley and Deborah used the IWB to broadcast films/film extracts. There was no use of any other IWB tools with the films, for example, annotating stills of the film.

Bryn showed a very short extract from a film of one text (The Great Gatsby) to illustrate an historical context point about another text (Of Mice and Men). Using a DVD, he quickly found the relevant point in the film and then he showed the excerpt twice, so that the students could grasp the point he was making. This showed the value of having a bank of DVD resources within the teacher’s reach.

Animation

Animation, within the context of this study, refers to images that give the impression of movement, usually through repeating a sequence of images. There was some evidence of this being used with ENF programs and with commercially-produced programs and applications. This sort of animation is usually used to attract attention. The examples seen within this study occurred not to support the meaning of the content but rather to be eye-catching.

Animation is a particular feature of PowerPoint, and it can be applied to written text and pictures to make them seem to move, for example when text ‘flies in’ or when text is revealed word by word. Apart from the basic animation that reveals texts, there was no evidence of texts or images being animated for particular effects.

Audio

There was very little evidence of the IWB being used for audio texts. During the fieldwork, the data collection instrument distinguished between voice audio and music/sound audio which included any other audio apart from spoken voice. There were no incidences of voice audio observed within the lessons, and only a limited amount of music/sounds audio. All of counts of audio were from commercially-produced resources.

Within the observed lessons, audio was not a feature that teachers incorporated into their own resources. In terms of the dual-channel assumption of CMTL, IWB use focused on the visual channel. Indeed, with its large screen, the IWB is perceived as a visual tool. However, just like computers, IWBs are usually fitted with speakers so it should be a viable venue for audio as well as visual content. It may be that this affordance of IWBs is being overlooked generally. Auditory information is, of course, a prominent feature of lesson. It emanates
directly from the teacher, as s/he speaks throughout the lesson. However, just as teachers in the study have recognised that images can support the essentially verbal nature of English teaching, it may be that the IWB can support the auditory information processing within a lesson too.

**Concluding comments on CTML**

The majority of IWB content observed in this study was written text and this was the most common single type of content that was observed. This may be unsurprising as English is a language-based subject. It is also clear that most of the teachers in the study are putting considerable thought into the presentation of this written text, in terms of size, clarity and providing reading pathways.

Some of the teachers are considering the overall effect of the content on the learners in terms of accessibility (for students with dyslexia) and with regard to the overall impact. The latter is particularly evident in presentations such as Alice’s, where a clear ‘house style’ has been created to provide consistency and clear signals to the learners as to the stage of their learning.

Where still images are used on the IWB, the evidence from this study is that they are often included for specific purposes as opposed to merely aesthetic reasons, helping the students to conceptualise a play performance, for example. In terms of Mayer’s requisite selection and organisation of the pictorial content (2005), there is evidence of selection but not strong evidence of organising the content to help the coherence of the learning. There is evidence of the deliberate selection of text as well as the conscious organisation of text (e.g. the use of coloured text, text boxes, etc).

The use of the IWB for auditory content was almost non-existent (apart from the sound accompanying video). The CTML highlights the inclusion of consciously selected and organised auditory content as a crucial consideration of multimedia learning resources. It may be that the sample teachers are too reliant on their own voices and are overlooking the value of other sources of audio content. The conscious use of auditory material through the IWB technology would seem to be a useful and obvious choice of resource for a language-based subject, and one that is currently under-utilised.
7.5 The purposes of IWB use

This study explores the purposes for which English teachers in the study use an IWB in their lessons. When asking about the purpose of IWB use, the term purpose carries with it both connotations of objectives/intentions as well as functions/tasks. By examining all of the data sources, it is possible to consider and give some sense of both why the IWB is being used and also the functions that it performs within an English teaching environment.

Over a decade of practice, combined with a dearth of training and guidance (Chapter 6.9), has led to teachers establishing their own objectives and practices of working with IWBs. As might be expected within a context where practitioners are devising their own approaches and uses, there are differences in how the IWBs are used by the teachers within the sample. However, there are also commonalities in the practices of the teachers which may indicate more widespread objectives and purposes for IWB use.

Focusing on the purposes for IWB use in the case study teachers’ lessons, brings together data from all three data collection methods. Across the sixteen lessons of the seven teachers, there are similarities of practice that indicate general patterns of practice that are commonly followed.

When asking why an IWB is used in an English lesson, there are clearly a variety of purposes, covering a range of objective and functions. In order to explore and give a sense of the extent of such purposes, this study considers the following areas:

- the broad delivery of the teaching and resources
- the stage within a pedagogical sequence
- the cognitive engagement being targeted
- subject content used on the IWB.

7.5.1 Broad delivery

Thinking in terms of the broad uses that an IWB can be put to, data was collected (through systematic classroom observation) on three main uses:

- display/broadcast
- writing/annotation
- manipulation of material on the IWB (e.g. by finger or pen).
The data revealed that the IWB was used by the sample teachers as a display technology. Seventy-eight percent of the ‘counts’ made for the overall function of the IWB, during the systematic observations of lessons, was for display and broadcasting (Table 7.1).

The teachers in this case study used the IWB to present materials for visual display. The broad uses associated with its touchscreen capacity (writing/annotation and manipulation of materials with a pen or finger) account for less than a quarter of the observed use. This is significant as it indicates that a major feature of the technology – its touchscreen capability – is not greatly used. The majority of the interactions with the IWBs can be initiated through the use of the computer mouse, as opposed to directly working at the IWB with a pen/stylus.

<table>
<thead>
<tr>
<th>Functions</th>
<th>Display/broadcast</th>
<th>Writing/annotation</th>
<th>Manipulation of materials</th>
<th>Totals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of counts</td>
<td>292</td>
<td>59</td>
<td>26</td>
<td>377</td>
</tr>
<tr>
<td>Percentage of counts</td>
<td>77.5%</td>
<td>15.6%</td>
<td>6.9%</td>
<td>100%</td>
</tr>
</tbody>
</table>

Table 7.1: The number of counts of each type of board use

7.5.2 The pedagogical stages when IWBs are used

As has been noted (Chapter 7.3), Bryn considers it appropriate to use IWB at any stage of his teaching cycle. However, an assertion that the IWB can be used at any stage in teaching may not be borne out in practice. Examining when the sample teachers used IWBs in terms of the pedagogic stages of the lesson, should provide insight into where teachers see IWBs as useful within a pedagogic sequence. As the cases within this case study are the teachers, the focus is primarily on teaching using IWBs, as opposed to learning with IWBs. Consequently the framework used to examine this aspect is concerned with teaching and instruction. The pedagogical stages used in the study are based on Gagne’s Nine Instructional Events (Gagne, 1985) and are listed again below as a reminder.

1. Gaining attention
2. Identifying objectives
3. Recalling prior learning
4. Presenting stimulus
5. Guiding learning
6. Eliciting performance
7. Reviewing/plenary
8. Feedback/assessment

These stages provide a general framework for considering when IWBs are used, in terms of the stages of teaching and instruction.

**Teacher use**
Each of the stages apart from one – *feedback/assessment* – was observed in IWB use in the sixteen lessons, indicating that the observed teachers are developing the use of the IWB throughout most of the teaching process. However, certain stages were observed more frequently with IWB use than others. *Guiding learning* is the stage most often associated with teacher-use in this study. There were nearly twice as many counts of *guiding learning* than *presenting stimulus*, the next most counted stage. These two stages – *presenting stimulus* and *guiding learning* - are also the only stages that all of the teachers were observed addressing when using an IWB.

The effect of using an IWB to deliver these stages of a lesson, is that the IWB takes the place of a textbook or worksheet. This approach reinforces the observation made above (Chapter 7.3.1) about the use of prepared texts on the IWB. Screens of prepared texts which provide information and stimulus, and are then used to guide the learning with instructions and questions, produce the effect of a textbook. The IWB is used as a large textbook, containing the content, rubrics and questions that a text book might include. A significant difference with the traditional textbook however is, as noted in Chapter 7.3.1 above, that this IWB *textbook* is designed for the use of the particular class being taught. Key elements such as the amount of content, the level of challenge, the pace and the language are all under the control of the teacher. This textbook is easily customised.

**Student use**
When students were observed using the IWB, the single stage most frequently counted was *eliciting performance*. Indeed, the only time that students came out to the front of the class and used an IWB during this study was at this stage of instruction within a lesson. The students were not observed as engaged at the IWB in any other stage of instruction.

The limited nature of student involvement with IWB has already been noted within this chapter (Chapter 7.2.2.). Their use of IWBs accounts for just under one-fifth of the observed use, and the majority of this use is from one lesson where students gave speaking and listening presentations. The stage of instruction observed – *eliciting performance* - indicates that any likely involvement by pupils with IWB is generally towards the end of the sequence of
instruction. In terms of IWB use, pupils’ engagement with the learning is confined to quite a specific part of the instruction process. They are allowed or invited to use the IWB when they have to present the proof of their learning by using the IWB to evidence their knowledge, skills or understanding.

The restriction of student use to the *eliciting performance* part of the instructional process is a significant finding. Whilst it may appear entirely logical that student involvement within the instructional process is mainly focused on showing whether they have grasped the learning objectives, restricting student involvement with the IWB to one stage of the instruction process may limit their engagement with the process overall. Instead of supporting student interest and participation with the whole of the teaching and learning process, student use of the IWB is associated with demonstrating their learning. This may be viewed as a rather challenging and possibly intimidating type of involvement. More significantly, the focus for student engagement (when using the IWB) is with the culmination of the process rather than throughout the teaching and learning process.

Confining student engagement with the IWB to one part of the teaching process may result in a tendency for the learners to be regarded as observers or even bystanders for other parts of the process, when they might very well be expected to be fully engaged in the ongoing activity. Highly prepared lessons, where content is already carefully mapped out at the start of the lesson, can lead to highly paced lessons, where student contributions are minimal. Moss *et al.* (2007, p. 8) caution of against this ‘transmission style of whole class teaching’ which reduces students to a ‘spectator role’. They call for further exploration of creating ‘more space for pupils’ involvement in the creation of lesson content’ (*ibid*.). Such a transformational approach to learning, noted earlier (Chapter 7.2), where technology is seen as a significant support for student involvement within the learning process, making the process of learning more learner-centred (Burden, 2002; Rudd, 2007), is not generally evidenced by the data within this study. The majority of the evidence points to technology supporting traditional methods of teaching.

Indeed, it might be concluded that the IWB further helps to control and confine the contributions of students. If the IWB marks the locus of power and control (Chapter 7.2) and the use of the IWB is subject to a high degree of preparation and lack of spontaneity (Chapter 7.3.2), it is possible that the IWB is actually constricting students’ engagement in the pedagogical process. Certainly the restriction of student engagement with IWBs to a very
specific part of the instruction sequence emphasises the teachers’ dominance in using this
technology and the students’ limited involvement.

**Commercially-produced resources**
Commercially-produced resources were not noted across all the stages of instruction and were
most likely to be used for *presenting stimulus* and then for *gaining attention*. The English
teachers in this study appear to use such resources for specific roles: engaging students’
attention, with the use of games for example, and for the provision of information and
content. Their use is limited to a bank of resources that are dropped into the lesson when
needed.

**Absence or paucity of IWB use**
Identifying the stages in the pedagogic process where IWB is *not* widely used by the sample
teachers is also illuminating. There was no evidence in this study of the IWB being directly
used to support *feedback/assessment* processes. The lack of a focus on assessment may be for
a number of reasons, such as:

- assessment is perceived as an individual matter and best addressed with individuals
- the IWB is considered too public an arena and the teacher wishes to avoid
  embarrassing individuals
- the pedagogical stages were not at the point of assessment in the lessons observed
- teachers do not see the relevance of this technology to assessment and feedback.

However, assessment is a core aspect of teaching and the seminal text *Inside the Black Box*,
Black and Wiliam (1998), argues for the primacy of formative assessment in effective
teaching. The writers note various features that help to create the environment for effective
formative assessment, including providing opportunities for students to articulate and
explore their understanding and thinking, and enabling all students to enter into a reflective
dialogue with the teacher. The IWB would seem to offer a platform for such interactions and
as it has been evidenced elsewhere, for example, an English teacher using a visualiser and
IWB to lead a class dialogue on improving one student’s writing (Grosset, 2008).

Perhaps a more surprising finding is that IWBs were generally not used for *recalling prior
learning*. Saving content is a feature of IWBs. Notes and resources from a previous lesson can
be saved and revisited, but there was little evidence of teachers using the IWB to revisit or
review work done previously. When working with their own resources, teachers worked with
screens/resources that were new to the students being taught. It would appear that this
memory capacity of IWBs is an underexploited resource.
7.5.3 The cognitive focus for IWB use
Using the classification of the cognitive domain as devised within Bloom’s Taxonomy (Bloom et al., 1956), the researcher considered the cognitive levels addressed by the use of the IWB in the observed lessons. Figure 7.16 provides a reminder of the results.

The prevalent cognitive level is comprehension (40%). Comprehension and knowledge account for two-thirds of the ‘counts’ within the data collection. The IWB, therefore, appears to be a venue where the teachers provide pupils with opportunities to meet and understand the information, ideas, instructions and materials that they require for the lesson. The IWB is being used to support students’ familiarity with and understanding of the lesson ideas and content. This is reinforced by the fact the IWBs are used most heavily in the first third of lesson (7.3.1) where more focus on familiarity and understanding might be expected.

Application of the information and understanding is the next most counted cognitive level, with just over a fifth of counts. There is far less evidence of the higher level cognitive skills, with analysis accounting for 12% of the counts and evaluation was only counted twice. Synthesis was not evidenced at all.
The use of an IWB, in terms of students’ cognitive engagement with the work of the lesson, is focused on the lower order skills within Bloom’s taxonomy. It appears that the IWB is perceived (and used) as a conveyer of information; a place for instructions; a means to check on understanding. The tendency for teachers to use mostly prepared content has already been noted (Chapter 7.3.1). Teachers within the study used the IWB as a means of structuring and reinforcing their planned teaching – as scaffolding. The observed lessons did not show the IWB as a location or catalyst for developing the higher order cognitive skills, apart from some evidence of analysis. In the practice of the English teachers observed, the IWB, in the main, appeared to be performing a supportive and back-up role to the teacher in delivering information and instructions, rather than a means for extending understanding into higher cognitive skills.

7.5.4 English subject content

In order to gain insight into whether an IWB is used by English teachers for particular aspects of their curriculum, this study examines where the IWBs were used by the teacher for teaching areas of English. In order to do this, the analysis focused on two main areas:

- the main frameworks governing and/or guiding English teaching
- typical study areas addressed within the English classroom.

The national frameworks for teaching English

At the time of the fieldwork, mainstream English teaching was guided by two frameworks for teaching English:

1. the National Curriculum (NC) (2007) – the statutory programme of study for Key Stage 3 and 4

The study selected the key structural features of the frameworks, to ascertain whether and how IWB met the demands of both frameworks. Table 7.2 provides a reminder of the NC attainment target areas considered and the percentage of counts within the content analysis. It also indicates the percentage of counts within each NC area, as broken down by the FSE.

A quarter of the counts revealed the IWB being used to support and teach writing. In particular, the IWB was used to help generate ideas for writing (for example, Figure 7.17), as well as exploring the conventions of writing (for example, Figure 7.18). There was quite limited use of the IWB to shape writing (for example, Figure 7.19). However this was the least
observed of the NC attainment target areas being supported by IWB use, a finding that supports the earlier supposition that the IWB is not widely used by the study teachers for the creation of text within a lesson. Rather, the IWB provides students with prepared texts for consideration in the lesson. Even with the examples shown below, there is a high degree of preparation of the resources.

<table>
<thead>
<tr>
<th>NC attainment target areas (% of counts for each area)</th>
<th>Skill areas as defined by the FSE</th>
<th>% of counts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Speaking and listening (31.2%)</td>
<td>Speaking and presenting</td>
<td>93.2%</td>
</tr>
<tr>
<td></td>
<td>Group discussion and interaction</td>
<td>6.8%</td>
</tr>
<tr>
<td></td>
<td>Listening and responding</td>
<td>0.0%</td>
</tr>
<tr>
<td></td>
<td>Drama, role-play and performance</td>
<td>0.0%</td>
</tr>
<tr>
<td></td>
<td>Total (S&amp;L)</td>
<td>100.0%</td>
</tr>
<tr>
<td>Reading (43.9%)</td>
<td>Reading for meaning</td>
<td>71.1%</td>
</tr>
<tr>
<td></td>
<td>Understanding author’s craft</td>
<td>28.9%</td>
</tr>
<tr>
<td></td>
<td>Total (reading)</td>
<td>100.0%</td>
</tr>
<tr>
<td>Writing (24.9%)</td>
<td>Composition: generating ideas</td>
<td>40.4%</td>
</tr>
<tr>
<td></td>
<td>Composition: shaping</td>
<td>21.3%</td>
</tr>
<tr>
<td></td>
<td>Conventions</td>
<td>38.3%</td>
</tr>
<tr>
<td></td>
<td>Total (writing)</td>
<td>100.0%</td>
</tr>
</tbody>
</table>

Table 7.2: The percentage of counts for English NC and FSE skills areas
Figure 7.17: An example of using the IWB to generate writing ideas

Figure 7.18: An example of using the IWB to consider writing conventions

Figure 7.19: An example of using the IWB to shape writing
During the observed lessons, the IWB was not used in any significant way for the writing and creation of texts – either by the teacher or by students or by teacher and students together. Evidence from the observed lessons indicates a stronger focus on IWB use supporting reading rather than writing. However, interview data shows that some of the teachers use some pedagogic strategies - for example, modelling and collaborative learning – to support both reading and writing tasks. Alice stated how she uses the IWB to stimulate writing: ‘So I do use a lot of images actually to sort of just spur their thinking and to get them thinking – and it gives them a discussion but it enables them to write – especially when we’re looking at creative writing.’ Modelling was a strategy also mentioned by five of the teachers, but this appeared to be more in the sense of providing a completed example to see as a model for writing, rather than exploring or sharing the process of writing on the IWB together.

There was perhaps a surprisingly high count of speaking and listening observations. Nearly a third of the observation counts were of speaking and listening but this is a figure which, in the main, reflects one lesson where students gave presentations and made extensive use of the IWB to support their presentations. There was little evidence of the IWB being used to support discussion or group work, and no evidence of it being used for promoting distinct listening or drama skills. It is used as a tool to help presentational skills, for example, through providing a structure to a talk or by providing complementary images to support the talk.

The main focus of IWB use in the English classroom, in terms of the NC and FSE, is within the area of reading and, in particular, reading for meaning. This endorses earlier assertions that the IWB is used by the teachers to present prepared text and to use the IWB a class text book, where text is displayed for the whole class to consider and comprehend (Chapter 7.3.1). Whilst there is some use focused on understanding author’s craft, the IWB is not extensively used for the exploration and investigation of writers’ skills and texts. The large display provided by an IWB is mainly being used by the study teachers to present text for comprehension, rather than presenting it for exploration. There was also little evidence of the IWB being used to teach and explore the process of writing. This again, emphasises the overall nature of the IWB’s use within the study, which is as a conduit for presenting materials, information and instructions. The nature of IWB use is to present prepared content, rather than exploring, manipulating and developing content in real time in the classroom.
**Typical English study areas**
As well as the broad areas of study, indicated by the national frameworks, English teachers also inform their medium and long-term planning by structuring their teaching into study areas or units of work. These areas are often based on types of text or reading (novels, for example), by types of writing (autobiography, for example) or by speaking and listening objectives (giving a presentation, for example). Within this study, the following study areas were chosen as being typical of English areas chosen by departments:

- novels
- poetry
- drama/scripts
- non-fiction study
- media study
- pupil response.

![English study areas](image)

**Figure 7.20: The percentage of counts for each English study area**

Figure 7.20 provides a reminder of the percentage of counts for each English study area. The category of *pupil response*, was introduced in the analysis stage to account for the type of study which is focused on helping student to develop their own individual responses to topics of study. It is the single most counted area, due to the amount of counts in Lesson 11 where the students gave individual presentations. In the case of Lesson 11, they used PowerPoint presentations in two main ways. Firstly they structured their talk, by using six slides to present aspects of their talk. Secondly they used the slides to display visual material pertinent to their talk. The students used the PowerPoint presentation in much the same way as many of the
teachers, using a mix of written text and still images (for example, Figure 7.21). Within their six slides, they tended to create their own house style for aspects such as use of coloured backgrounds and size of text – just as the teachers did. Sometimes they added written text which acted as a script. Some designs which were difficult to read (for example, Figure 7.22) but they were mostly clear and accessible. The animation features of PowerPoint were generally not used, and the resulting presentation was often rather ‘flat’ and lacking energy. This lack of ambition with the program would appear to reinforce the possible benefits of training pupils to use IWBs as mentioned above in Chapter 7.2.4.

Fifty percent of IWB use was related to the study of novels and poetry. This may replicate the proportion of study on novels and poetry in the English classrooms studied, or it may be that the IWB is perceived as a suitable location for studying such areas. Whichever the case, it emphasises the role of the IWB within English lessons as being strongly focused on text, and
the delivery of a text-heavy approaches to using the IWB. The IWB appears to be a venue for showing, considering and understanding text. The texts shown are designed to provide information and to extend understanding but the collaborative exploration and investigation of texts was not often noted in the study. Similarly the writing of texts together was infrequent. Texts were presented ready prepared. There was no evidence of a shared process to writing when using the IWB. Rather the IWB was used to present ideas, conventions and stimulus, but not as the location for the writing.

IWB use within this study is essentially a process of planning and preparation. For the teacher, this means preparation of the materials to be used on the IWB prior to the lesson. For the student, the IWB provides the instructions and stimulus to help them prepare their own study of English. As has already been noted, the IWB is being used as a class textbook. It prompts, it informs and it delimits. It is rarely, however, the site of creation, innovation and development.

7.6 Teacher professional knowledge and development

Without exception, the teachers involved in the study exhibited a real commitment to effective English teaching; they all showed an enthusiasm for using IWB technology to help them do this. However they are working within an education landscape that Mercer noted as ‘technology-led’ rather than ‘pedagogy-led’ (2010, p.xv). Changing the nature of this landscape will require changes in the way that educational technology is regarded, and how technology is introduced, and it will also require careful attention to continuing professional development (CPD).

Knowledge of the technology alone is not sufficient for successful technology integration. Technological knowledge must inform and be informed by both content and pedagogical knowledge. The TPACK framework is therefore used to consider the case study teachers’ development of these three domains of professional knowledge (Mishra and Koehler, 2006).

This section will consider the use of the IWB in the observed lessons, in relation to the four components of TPACK that centre on technology use:

- technology knowledge
- technological content knowledge
- technological pedagogical knowledge
- technological pedagogical content knowledge.
Technology knowledge

*Technology knowledge* is a teacher’s understanding and command of classroom technologies for communication and information handling. It is a body of knowledge that is difficult to define, due to the changeable nature of technology, something which is clearly illustrated by Koehler and Mishra themselves. When they list the technologies a teacher might be expected to know, they concede the list might be quickly outdated, and indeed the inclusion of the increasingly outmoded ‘overhead projectors’ (Koehler and Mishra, 2008, p.24) in their list proves their point.

Technological knowledge relating to IWBs, at the time of writing, might include understanding of:

- operation of the IWB
- the peripheral equipment used with IWBs
- the electronic notebook/flipchart (ENF) software designed for IWB use
- other types of software designed for IWB use
- generic software and applications that might be used with the IWB.

Within this study, the main focus was upon the case study teachers’ interaction with the software and applications used with the IWB. It emerged that the teachers worked mostly with one core program on their IWB. This was either ENF or PowerPoint. By choosing to use one or the other, the teachers indicate that they consider the programs to be alternatives. However, these programs have different affordances, so by choosing only one program to work with, the teachers reduce the possibilities available to them. For example, it has been noted that handwriting, a key tool in English study, was more likely to occur with teachers using ENF. Teachers who use mainly PowerPoint were less likely to handwrite or annotate. The teachers’ technology knowledge about these applications does not appear to be sufficiently robust to appreciate the affordances of both programs. Therefore, heightened awareness of the differences between the affordances of both types of program, as well as training in their use, is needed if teachers are to make effective use of both programs.
Technological content knowledge

Knowledge of technological content refers to an understanding of the relationship between technology and content, and how content can be affected by the use of technology (Mishra and Koehler, 2006). As has been noted above (Chapter 8.3.1) IWB use within this study is heavily associated with the display and broadcast of content. The IWB was used most heavily during the initial third of lessons, with its key role being focused on the transmission of information, instructions and guidance. When considering the multimedia capacity of IWBs, it was noted that content in this study consisted primarily of written text and still images. In terms of English subject content, half of the observation ‘counts’ were for the study of poetry and prose texts, reinforcing the use of IWBs as a venue for text. The teachers developed a consistent approach to presenting the content akin to a house style. Indeed, the overall effect was of the IWB being used as a whole-class textbook, for the transmission of ideas, instructions and guidance. The limited use of multimedia possibilities such as video, audio and animation perhaps indicates conservative use of content through this type of technology.

A positive aspect of this digital ‘textbook’ is that it may be created for one particular department or class. This enables tailoring and differentiation of the material to suit the needs of those particular learners, although this relies on the capacity of the teachers to provide clear navigation routes through the content. The study shows that some of the teachers are using coloured text, backgrounds and image to design accessible content. However, there was a dichotomy between those teachers who take clear design decisions and those who use ‘rule-of-thumb’ strategies. Teachers within this study appear to be aware that content may be adapted through technology use, but there is a lack of certainty and consistency in their approaches.

Technological pedagogical content

Technological pedagogical content refers to the influence of technology on teaching and learning design and strategies (Mishra and Koehler, 2006). Explicit consideration of the influence of IWBs on pedagogical matters was made through consideration of which pedagogical phase stage of the lesson was being addressed by IWB use. Teacher use of the IWB was most associated with guiding learning and after that presenting stimulus. Such use reinforces the perception of the IWB being utilised as a large, whole-class textbook. Operating this big textbook at the front of the classroom is the teacher and, whilst the IWB was
occasionally used for investigating ideas and stimulating discussion, the technology reinforced teacher power and control.

This situation is reinforced by limited student use of the IWBs. With the exception of one lesson where students made presentations, the teachers were the main users of the IWBs in all of the observed lessons. Most student use of the IWB was closely supervised and limited. Students usually approached the IWB, one-by-one, and completed short, limited tasks. Their contributions were all focused on showing what they had learned, as opposed to engaging in the process of learning through the use of the IWB. Students became engaged with the IWB towards the end of the learning sequence.

Some of the teachers expressed understandable concerns about student use of the IWB (for example, it slows down the pace of the lesson). However, a model of use which restricts students’ contributions may also have the effect of giving the students a ‘spectator role’ in the process (Moss et al., 2007, p.8). Such a model emphasises teacher control and negates the notion of pedagogic interactivity. Interactivity, as noted in Chapter 2.4.2, is conceived of as requiring interaction between people (Glover et al., 2005), as involving learner participation and autonomy (Kennewell et al., 2008) and allowing different levels of interaction from surface to deep (Hargreaves et al., 2003). Jewitt, Moss and Cardini (2007) helpfully define three types of interactivity related to IWBs - technical, physical and conceptual – asserting that conceptual interactivity (engagement with learning and ideas) is more important than physical operation of the IWB. However, all definitions have the engagement of the learner at their core.

The evidence of this study appears to show no big shift to a more interactive style of teaching and learning. Rather, the use of the IWB as a textbook and to support teacher control reinforces traditional approaches. Teachers may express the desire to have the students at the board, but it is the teachers who remained firmly in control of the IWB throughout most of the observed lessons.

The introduction of IWBs initially held great promise for developing a more interactive approach to teaching and learning, due in part, no doubt, to the nomenclature of the technology. However it is not the technology that brings about the change. Teachers determine the pedagogy of a classroom and IWBs will only have significant impact ‘if teachers are prepared to change their teaching approaches to a more interactive mode’ (Miller and Glover, 2010, p.11). The evidence from this study shows that the majority of the teaching
involving IWBs demonstrates a transmission style of teaching, with the teacher in control and limited pupil engagement. The teachers do not appear to have responded to the ‘creative flexibility’ afforded by new technologies to pedagogical processes (Harris, Mishra and Koehler, 2009, p.398).

**Technological pedagogical content knowledge**

Harris, Mishra and Koehler assert that technological pedagogical content knowledge (TPACK) underlies ‘truly effective and highly skilled teaching with technology’ (2009, p. 401). TPACK knowledge refers to more than understanding of the individual components. Effective teaching with technology demonstrates understanding of the affordances and constraints of content, pedagogy and technology, as well as insight into how these elements influence and interplay with each other. Successful use of technology lies with teachers’ ‘fluency and cognitive flexibility’ in utilising, combining and moving between the different domains (Harris, Mishra and Koehler, 2009, p.402).

Clear examples emerged from this study of teachers successfully integrating their knowledge of content, pedagogy and technology to support students’ learning. A straightforward example of this can be found in a lesson taught by Beverley. She used the Internet to collate images of different productions of the play *An Inspector Calls*. The images were juxtaposed for comparison, so that students could appreciate and discuss the different interpretations of the play. A more sophisticated use of technology to support content and pedagogy was found in a lesson by Alice. Exploring the concept of identity, she offered statements which the students had to consider and decide on whether they were true or false. Using ENF software she constructed an activity in which students had to manipulate a statement about the nature of identity. If students moved the statement to the wrong box, the statement disappeared. This led to discussion amongst the learners about the reason for the disappearance. The learner was then able to change their mind and move it to the right box. In both these examples, the content of the lesson is the driving factor, and the teachers use their knowledge of pedagogy and technology to develop the learners’ understanding of the content. However, the nature of the technology influences the content and the pedagogy. For example, using images from the Internet meant that Beverley could use an image from a production she had seen, and she was able to share and discuss this first-hand experience with her learners.

The examples above emphasise the role of teachers as ‘curriculum designers’ (Koehler and Mishra, 2008, p.21). They blend content, pedagogy and technology to design the learning curriculum. As Koehler and Mishra go on to explain ‘Teachers construct curricula through an
organic process of iterative design and refinement, negotiating among existing constraints, to create contingent conditions for learning’ (ibid.). It follows that teachers will require time for training, practice and reflection to develop TPACK. However, one of the most striking findings from the teacher interviews was the revelation of a lack of professional development and training in this area. The teachers in the study had minimal or no initial training with IWBs, and no subsequent or on-going training. All of the teachers felt that this was an issue. The most cited manner of learning about practice was learning from peers. Very often this was of an ad hoc nature, as one teacher has a ‘natter’ with another teacher (Deborah).

The teachers could be very specific about their needs, reflecting the amount of consideration they had given the matter. One teacher recognised the benefits of learning about the technology as a department so that they were able to develop their skills for individual and departmental benefit. Keeping up-to-date with the technology was also recognised as essential, if they were to use the equipment effectively. Another teacher expressed a desire for subject-specific input. She recognised that resources and strategies were used in other subjects but felt that English was not benefiting from such input. The teachers’ own recognition of the need for training, together with the picture of limited use in some areas that has emerged from this study, indicates a clear need for subject-specific, pedagogically-focused training in order for IWB use to become properly embedded in English departments. Until teachers are given sufficient opportunity and time for professional development in this complex, fluid and changeable area, then it is unlikely that TPACK will develop strongly.

7.7 Concluding points

This discussion of the findings has taken the evidence from the data collection and examined it in the light of the different parts of the research question. This has provided insight into the type and pattern of use within the observed English lessons. It has attempted to capture patterns of use with regard to the users of IWBs, the timing of their use, aspects of content and the purposes for use. The next chapter will draw conclusions from this discussion, in the light of the particular theories that have informed this study.
8 CONCLUSIONS

This final chapter both concludes and looks beyond this study. It reflects critically on the process, and highlights the key findings in the light of the main theoretical concepts informing the study. It also considers possible future directions for research.

8.1 An overview of the study’s originality and contribution to knowledge

By focusing on IWB within secondary school English classes, this study provides much needed empirical research into this core secondary school subject. In contrast to the other core subjects (mathematics and science), there have been few studies focused on the use of IWBs within secondary English teaching. This study, therefore, aims to add significantly to the knowledge and understanding of IWB use within English.

Whilst many of the findings may be of interest to other subject areas, such as the division between teachers using ENF programs and PowerPoint or the approach to planning noted, there was clear focus on English teaching. Much of the data collection concentrated on areas pertaining to English teaching. This level of focus on specifically English content and skills has not been observed by the researcher in any other studies.

Established practice is illuminated through examining the cases of seven English teachers who frequently use the technology. This contrasts with many other studies, where the researchers have focused on new or recent adopters of IWBs. With one exception, the English teachers under focus have at least two years teaching experience and they are experienced in using IWBs. This study examines established, embedded practice amongst a range of English teachers, a set of factors that has not been discovered by the researcher elsewhere.

8.2 Trustworthiness and generalisability

A mixed methods approach enabled a wide range of data to be gathered which was carefully focused on each case study teacher. As well as supporting methodological triangulation (Denscombe, 2007), the different methods provided a rich vein of data which yielded some fascinating insights into the practice, resources and strategies used by the sample teachers. Quantitative data was retrieved on such areas as when IWBs are used within a lesson and what programs are used, whilst qualitative data was gleaned on design decisions and training.
The methods were designed to avoid unnecessary overlap in the collection of data, but opportunities were built in for:

1) one method being used to check on another; for example, the systematic observation records were cross-checked against the content analysis;
2) creating productive links between methods; for example, the content analysis provided ‘screen shots’ of content to be discussed within the interviews.

The interrelated nature of the methods provided the researcher with a recurrent way of moving between the methods, which also supported triangulation and a connected understanding of the data. Each method is considered a significant and valuable contributor to the data collection and – in keeping with the proviso of Teddlie and Tashakkori (2006) on mixed methods studies - the data from the different methods are integrated within the findings.

Each of the methods was affected by the changeable nature of school life. It proved impossible to observe the same number of lessons by each teacher. Ideally, observing the same number of lessons by each case study teacher might have led to a more balanced spread of data from each school, but last minute changes to arrangements in two of the schools meant that this was not possible. Nevertheless, the purpose of the research is to gain insight into teachers’ experiences with IWB, across a number of departments, and this has been achieved.

The completeness of the data was affected by technological problems in two of the observed lessons. Each lesson was subject to two data collection methods:

1) systematic lesson observation
2) recording of the IWB content.

As the researcher remained responsible for both methods during the lessons, when problems arose with the recording of the IWB content (in two lessons), the researcher was unable to detect and correct the fault. This led to the loss of valuable information for two of the sixteen lessons for the content analysis. This is regrettable but it was not unduly detrimental to the overall method, as content was still able to be analysed from all of the participating teachers, and there was still a significant body of data to analyse.

The corpus of data gathered and the subsequent findings are drawn from the case studies. Such an approach precludes the process of generalising from the practices observed and examined, as each case is bounded by its own context. The individual circumstances of each
specific case may not be transferrable elsewhere. Instead, this study conforms to the practice of drawing out rich descriptions of how the case study teachers are utilising the IWBs in their classrooms. By so doing, it is possible to draw attention to the models of practice, and even patterns of practice, found within the case study schools. Such an exploration of the data takes our understanding of the use of IWBs in English teaching well beyond anecdotal views and opinions of the use of the technology in this core subject, but stops intentionally short of applying any of the findings across a wider field. Rather, this study stands as a descriptive case study (Tellis, 1997), one which is ‘discovery led’ (Denscombe, 2007, p.38), and which opens up topics and ideas for further study and consideration. It leads to what Bassey (1999) calls fuzzy generalisations, where ideas offer possibility and are raised in recognition that they may not be isolated and may indeed be significant. The key discoveries from this study are posed in the next section.

8.3 The central conclusions

The data collected, and the findings from these data, have been explored in some detail in Chapters 4 to 6, as well as being examined in relation to the research question in Chapter 7. Within this chapter, the key observations and findings are considered within the context of the three main theories that have informed and helped to shape this study:

- the theory of affordances
- the cognitive theory of multimedia learning (CTML)
- technological pedagogical content knowledge (TPACK)

8.3.1 The affordances of IWBs for English teaching

As was noted towards the start of this study (Chapter 1.5), an ‘affordance’ is what something ‘provides or furnishes’ (Gibson, 1986, p.127) to an observer. It also provides an indication of the relationship between the two. In the case of IWBs, the notion of affordances provides a means to consider the relationship between English teacher and IWB. This study seeks to establish how the IWBs are regarded and used by the sample teachers.

Gibson states that affordances may or may not be perceived by an observer. They are not dependent on the needs of the observer but ‘the object offers what it does because it is what it is’ (1986, p.139). In the case of IWBs, they have various affordances which may or may not be perceived by the teachers. However, ‘ambient light’ is required to see affordances (Gibson, 1986 p.140) and so a further consideration is whether teachers are given the right conditions (‘ambient light’) to perceive and benefit from the affordances.
The affordances of IWBs are many and varied, and have been referred to throughout this study. This conclusion, therefore, will focus only on those affordances that have emerged as significant in some way.

**Display and broadcast**
The teachers in the study regard *display* as the major affordance of this technology. Nearly 80% of the observational counts made during the lesson observations were for displaying/broadcasting material. Writing on the IWB and manipulation of content (for example, moving text using a pen) were noted but in much smaller quantities. For the teachers in this study, this is a piece of presentational technology. The touchscreen capacity of the IWB, which allows writing on the board and manipulation of content, comes beneath presentation in terms of use. This view is reinforced by other findings particularly with regard to handwriting, to planning and preparation and to the choice of programs used on the IWB.

**Handwriting**
The capacity to handwrite content on IWBs is not an affordance which is commonly used by the sample teachers. There was little handwritten text used as teachers showed a huge preference for printed text. This affordance, indicated by the presence of pens with the IWBs, was not frequently used by the teachers. The awkwardness of the handwriting process and poor results of handwriting mitigated against handwritten content. If this finding were to be replicated with in a much bigger sample, it would be of significance to IWB manufacturers/developers. The spontaneity and flexibility allowed by handwriting is of particular importance to text-rich subjects such as English and the humanities. Improving the handwriting facility of IWBs would help to enhance this affordance.

**Planning and preparation**
A conspicuous aspect of this study was the amount of highly prepared materials used by the teachers on the IWB. The teachers took great care with planning and preparing materials for use on the IWB. Not only did they use the IWB’s affordance for showing ready prepared materials, but the majority of lesson content was created by the teachers themselves. This allows the further affordance of displaying materials designed and tailored for individual departments and classes. Conversely, there was little evidence of introducing spontaneous content or of creating content during the course of a lesson.

Interestingly, there is a tendency amongst some of the teachers to use the IWB content (e.g. the PowerPoint) as the lesson plan, so that the objectives and main points of the lesson appear on the IWB, almost like a script. Two of the teachers, Deborah and Beverley, reflected
on this process. Beverley considered that certain elements needed to be present (such as objectives) and Deborah described her approach which is to set up prompts to support both teacher and students. This type of use shares lesson planning more explicitly with the pupils and shows the IWB performing a fundamental role within the construction and organisation of the lesson. This affordance for preparing and marshalling content for the lesson is strong within this sample of teachers.

**Reading**
Of the principal areas of English study, reading figured most strongly in relation to IWB use. The IWB was used to promote reading for meaning, in particular. It was used as a venue for the whole-class reading and comprehension of texts and was therefore being used is its capacity to show texts to the whole class. Again, the focus is on presenting prepared content, as opposed to creating content through the use of the IWB. Developing and exploring writing skills accounted for only 25% of the observed content on the IWBs. The affordances of the IWB are very much focused on reading and comprehension with the teachers in this study.

**Affordances – overview**
Operating as a large, touchscreen computer, an IWB offers a huge array of potential uses and opportunities to teachers. What emerges from the study is that the IWB is usually a tool used to uphold content. It is used for the presentation of prepared content. The teachers utilise the capacity of the technology to integrate and organise content, and then present it. IWBs are used for transmission of information, ideas and instructions. In terms of English teaching, reading and comprehension are at the heart of its use. The lack of engagement with handwriting and introducing spontaneous material reinforces this model. The IWB is generally not used to explore ideas but serves to provide ideas, information and guidance.

This limited engagement with the affordances of IWBs may be deliberate, as busy teachers seek to make the adoption of sophisticated technology manageable. It may be related to limited training opportunities. All the teachers considered themselves self-taught. None of them had had any recent training, and most had only had one initial session on how to operate the IWB. The progress that they have made in using this technology has been due to their commitment to the subject and the technology. They commonly learned from their peers or even from pupils. This research shows a need for forms of training/development:

1. formal time to reflect on their practice, share experiences and plan with colleagues
2. training that provides an appreciation of the affordances of the technology, as well as insight into how this might be applied for English teaching.
8.3.2 The use of IWBs for multimedia learning in learning

That ‘people learn more deeply from words and pictures than from words alone’ is the main principle underlying of the CTML (Mayer 2005, p.31). This theory asserts that we have dual channels for processing multimedia information: visual/pictorial and auditory/verbal. The effective use of multimedia resources to support learning is centred on conscious selection and organisation of such resources. The IWB facilitates multimedia teaching and learning, and part of the focus on this study to focus on whether the sample teachers are using the multimedia capabilities of the IWB.

The findings from the study show the IWB being primarily a conduit for written text. Written text was the most commonly counted element in the analysis for content, followed by still images which had approximately half the observed counts of written text alone. Still images were used by all of the teachers, and in a range of different ways, for example, to model responses, to provide contextual understanding and to create a recognisable house style. This use of images to achieve particular effects appears to show the teachers consciously selecting images to support pedagogical intentions. According to Mayer (2005), this selection of material is a central aspect of building effective multimedia presentations. The other crucial element is the coherent organisation of the material. Again, there is clear evidence of teachers arranging material to support accessibility, for example, using coloured text to highlight questions or including coloured backgrounds to signify areas of text.

Multimedia use was limited, in terms of the types of multimedia used. The main types were written text and still images. Other content types, such as video, games and animation were very limited. There was also very little evidence of audio being used on its own.

The evidence suggests that the teachers in the study are conscious of the demands of working in a multimedia environment. Their treatment of written text and their recognition of the significance of pictorial content suggest that they are beginning to craft their multimedia content. However, as was noted in Chapter 8.3.1, there is a need for appropriate training and opportunities for reflection, in order to raise awareness and understanding of using multimedia resources on an IWB. In particular, they would gain from input on the following areas:

1. Establishing principles and protocols for the effective design and presentation of materials on the IWB, for example, use of white space, colour, fonts, etc.
2. Developing a wider range of multimedia content in their materials, so that they are using the potential of a wider range of materials than mainly written text. The use of
audio texts, in particular, would be an apt and significant multimedia addition to the mainly visual content of the IWB.

3. Developing an awareness of how the selection and combination of multimedia content can support learning. As Mayer points out: ‘Multimedia messages that are designed in the light of how the human mind works are more likely to lead to meaningful learning than those that are not.’ (2005, p. 46-7)

8.3.3 Technological pedagogical content knowledge (TPACK)

Finally, this study considered how the sample teachers integrate the IWB technology into their professional knowledge base. Digital technologies have ‘changed the nature of the classroom’ (Mishra and Koehler, 2006, p.1023) and as they have become more prevalent, teachers have found themselves having to enhance their knowledge of this area. However knowledge of technology alone is not sufficient for successful integration. Just as Shulman noted the tendency for content and pedagogy to be treated as separate domains, when successful teaching actually requires teachers to ‘confront both issues...simultaneously’ (ibid., p.1021), so Mishra and Koehler observe that technology knowledge is often considered in isolation when it needs to be considered alongside content and pedagogy. The TPACK framework supports a consideration of how well the domains of content, pedagogy and technology are integrated (Mishra and Koehler, 2006).

This study shows that the case study teachers’ understanding of IWB technology is limited. Their tendency to rely on one core program (either ENF or PowerPoint) reveals a lack of robust understanding of the affordances of both programs and what they offer to English teaching. The study also shows that content and pedagogy are characterised by traditional approaches: the IWB is used mainly as a digital textbook which supports both the transmission of content and the position of teacher control. There is also evidence of successful integration of IWB technology in the English teaching. For example, the IWB offers the opportunity for teachers to design the curriculum specifically for their learners, and the teachers in the study revealed an appreciation of this. However, there appears to be a need for a more developed knowledge and greater consistency of approach. Nevertheless, the progress that has been made by the teachers in integrating the technology is an indicator of their own commitment to successfully incorporating technology. The repeated revelation that they are self-taught in regard to IWB use, and have received minimal training exposes an area of need. Until teachers are given time for reflection, practice and development, especially within their subject area, integration of IWB technology will be deficient.
8.4 Further research

This research study sits within a growing body of research on IWBs. These studies cover a wide range of areas including reviews of the literature, impact studies, studies of conceptual areas (e.g. the nature of interactivity), generic pedagogic areas (e.g. collaborative learning) and specific pedagogic areas (e.g. mathematics teaching, primary teaching, SEN use). This study is situated within the final type of study listed, as the main focus is on exploring and illuminating practice within the subject area of English. It is a study which contributes to the body of research by increasing levels of knowledge and understanding relating to a core subject area of secondary teaching. During the course of the study, various questions and areas arose which were beyond the scope of this study, but which would benefit from further consideration and study. Two areas stand out for particular consideration.

This study is concerned with English teaching during secondary school. However, most secondary English students will probably have already experienced IWB within English and literacy teaching at primary school. In order to build on student experiences effectively, secondary colleagues need greater knowledge of how the IWB is used at primary level. Research that compares primary and secondary use of the IWB for teaching English would hopefully raise awareness of the affordances and the potential of this technology. One of the teachers in this study, Cherry, noted the possible influence of this experience on year 7 students: ‘– so the fact that it’s used a lot at primary school means the younger years that we’ve got seem more... they can do things on the whiteboard that I don’t know how to do’. For Cherry, the students come to secondary schools from primary with knowledge that she doesn’t have. They have an experience that is beyond her. Helping to provide a more complete picture of use and to provide information for teachers like Cherry, would help to produce a sense of continuity of use, where teachers of older students build on the practice that has gone before. It may help to secure firmer involvement of students in the use of the technology. Building on the approaches used within this present study, a picture of practice could be gained at primary level, with a view to comparing the data and the results to provide a more complete picture of how IWBs are used to teach English at primary and secondary level.

The second area for potential further research relates to student use of the technology. This present study notes teachers’ observations that students appear to like the technology and are generally keen to use it. However, as noted in Chapter 7.2.4, transformative use of the
IWB technology will require teachers ceding more of their overwhelming control of the IWB over to student use. Further research, focusing on encouraging a more student-centred use of the technology would help to explore ways of engaging students with the technology. Some of the teachers referred to the students’ knowledge being apparent within lessons. Formalising their involvement, through proper training in the use of IWB, may help to bring about a situation where teachers give more time and opportunity for students to use the IWBs in different ways for the development and sharing of their understanding. A study, which explores these possibilities and opportunities, could make a real contribution to the transformative use of IWBs.

8.5 Concluding words

IWBs were first introduced to UK schools towards the end of the 1990s; they are now found in around 85% of UK classrooms (Messenger, 2013). Their introduction has been accompanied by a wave of expectation, mainly related to an anticipated transformation of teaching and learning. Thomas and Schmid (2010) neatly summarise the research into IWB integration, which occurred in the first decade of the twenty-first century, as covering three phases from early small-scale studies to large government-funded reports to academic special edition publications on IWBs. They conclude that ‘Moss et al.’s (2007) assertion that, ‘the introduction of an IWB does not in and of itself transform existing pedagogies’ (p.5) is a warning that perhaps ought to be stamped on all new learning technologies rather like a government health warning’ (Thomas and Schmid, 2010, p.xx). In other words, teachers, and not technologies, are the architects of educational change.

The English teachers who participated in this study did so because they were happy and willing to share their practice. They are regular and frequent users of IWBs. This classroom technology is established within their classrooms. However the English teachers themselves recognise where practice falls short. When both the NQT teacher (Alice) and the longest-serving teacher (Bryn) use the phrase ‘trial and error’ to describe their main method of learning how to use IWB, they reveal a desire for a more informed approach to IWB use.

After over a decade of use, the affordances of IWBs in the English classroom are not clearly established. However, the findings of this case study, whilst not being generalisable, are aimed at stimulating interest amongst English teachers about some of the issues, large and small, that are raised within the study. Learning about the practice of the case study teachers, will hopefully stimulate teachers’ consideration of their own practice. Issues raised about issues and developments with also, hopefully, motivate teachers to ask questions about
such areas within their own experience. In such a way, this study will contribute to our evolving understanding of a technology that is now embedded in the educational landscape.
APPENDICES
## APPENDIX A

### Systematic classroom observation – data collection form

<table>
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<th>ON/OFF</th>
<th>School:</th>
<th>Teacher:</th>
<th>Obs No:</th>
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<tr>
<td>1 IWB off</td>
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<td>2 IWB loading up/closing down</td>
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<td>4 IWB on, in background</td>
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<td>5 IWB on, main focus</td>
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<td>6 IWB on, muted/blanked</td>
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<td>7 IWB malfunctioning</td>
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<th>Class:</th>
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<tr>
<th>USER</th>
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<th>2 other adult alone</th>
<th>3 pupil alone</th>
<th>4 teacher and pupil(s)</th>
<th>5 other adult and pupil(s)</th>
<th>6 pupil and pupil(s)</th>
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<th>1 whole class</th>
<th>2 selected pupil(s)</th>
<th>3 teacher (e.g. preparation)</th>
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<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEXT PREPARATION</th>
<th>1 fully prepared text</th>
<th>2 partly prepared text</th>
<th>3 created in class</th>
<th>4 other (add note)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TYPE OF CONTENT (incl. combinations)</th>
<th>1 text</th>
<th>2 still image</th>
<th>3 moving image</th>
<th>4 animation (e.g. ppt)</th>
<th>5 diagram/table/graph</th>
<th>6 audio</th>
<th>7 other (add note)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>MEDIA USED ALONGSIDE IWB</th>
<th>1 whiteboard/blackboard</th>
<th>2 flipchart</th>
<th>3 individual whiteboard</th>
<th>4 TV/video/dvd</th>
<th>5 audio tape/CD</th>
<th>6 text (e.g. book, worksheet)</th>
<th>7 work cards (e.g. card sort)</th>
<th>8 camera</th>
<th>9 mobile phone</th>
<th>10 laptops</th>
<th>11 visualiser</th>
<th>12 voting pads</th>
<th>13 slate</th>
<th>14 other (add note)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>BROAD FUNCTION OF IWB</th>
<th>1 display/broadcast</th>
<th>2 writing/annotation</th>
<th>3 manipulation of materials</th>
<th>4 resource management (e.g. saving file)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>COGNITIVE LEVEL OF MATERIAL</th>
<th>1 knowledge</th>
<th>2 comprehension</th>
<th>3 application</th>
<th>4 analysis</th>
<th>5 synthesis</th>
<th>6 evaluation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

272
## Content Analysis
Complete for each discrete IWB text within the lesson.

<table>
<thead>
<tr>
<th>1 Resource</th>
<th>2 Creator</th>
<th>3 Main composition elements</th>
<th>Stage of Instruction</th>
<th>5 Broad English skills and content</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Main part - purpose</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Non-text - invitation</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Visual aids</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Whole - writing</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Main - content</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Additional text elements</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Audio/visual</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Other</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Stage of Instruction**
- Gain attention
- Identify objectives
- Present material
- Guide learning
- Elicit performance
- Review/feedback
- Other

**Broad English skills and content**
- Spelling
- Writing
- Language
- Level of language
- Poetry
- Picture
- Inference
-事を
- Other

*Other* – further information
### Further notes/guidance on Content Analysis categories

<table>
<thead>
<tr>
<th>Resource</th>
<th>Guidance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type:</td>
<td>Use the key (box 1) to supply the most appropriate number for resource type.</td>
</tr>
<tr>
<td>Topic:</td>
<td>Indicate with tick if it's a repeated theme, e.g., has been covered in session.</td>
</tr>
<tr>
<td>Modified:</td>
<td>Indicate with tick if it's repeated but modified in some way (e.g., annotated).</td>
</tr>
<tr>
<td>Creator:</td>
<td>Indicate with tick if soil is prepared solely or mainly by a teacher in the school.</td>
</tr>
<tr>
<td>Other:</td>
<td>Describe aspects not covered by other categories to be noted here.</td>
</tr>
</tbody>
</table>

#### Composition elements

| Main text | The majority is typed/printed. This includes texts that have been converted from handwritten to printed text. |
| Main text: written | The majority of the text is handwritten. |
| Annotation | Annotation is extra notes written around or on existing text during course of learning. |
| Still image | Image refers to pictures, backgrounds, diagrams, tables or graphical elements. |
| Moving image | This may refer to video content. This includes a computer animation. |
| Movement/animation | This may refer to movement is used in a presentation, e.g., of a video. |
| Text background colour | Black or white (1), some or all coloured text (2) coloured background (3). |
| Colour non-text elements | Tick for some use of colour, graphics, images, tables etc. |
| Audio/voice | The audio is predominantly voice. |
| Audio music/sound | The audio is music or sound or sound effects. |
| Other | Describe aspects not covered by other categories to be noted here. |

#### Stage of instruction

| Main attention | The main purpose is to gain attention/motivate interest, e.g., use of game, animation, intriguing photos, etc. |
| Identify objectives | The main purpose is to provide the learning objectives, give expectations for lesson learning. |
| Recall prior learning | The main purpose is to recall previous tasks, experiences and learning, relating to this lesson. |
| Present stimulus | The main purpose is to present material, e.g., text, video to support learning. |
| Curricular learning | The main purpose is to provide guidance, e.g., questions, strategies, instructions, examples. |
| Drill/practice | The main purpose is to provide practice in the use of new skill or understanding, e.g., response to questions, writing responses. |
| Review/plenary | The main purpose is to reflect on progress, what has (or has not) been learned. |
| Feedback/assess | The main purpose is to provide feedback and or assess performance. |
| Other | Describe aspects not covered by other categories to be noted here. |

#### English skills and content

This category is split into two: broad categories of the FTE, and further common elements to English. The FTE categories should be completed. The common elements may be completed if appropriate.

| FTE | Use the key (box 2) to supply the most appropriate number for the broad English skill. |
| Read | Use the key (box 2) to supply the most appropriate number for the broad English skill. |
| Write | Use the key (box 2) to supply the most appropriate number for the broad English skill. |
| Language | Use the key (box 2) to supply the most appropriate number for the broad English skill. |
| Novel & prose | This includes literary prose, and might include novels, short stories, extracts, etc. |
| Poetry | This includes traditional poetry, lyrics, songs etc. |
| Play | This refers to studying a script, e.g., contemporary, Shakespeare, monologue, etc. |
| Nonfiction | This includes literary or non-literary non-fiction, e.g., instructions, biography, newspaper, etc. |
| Media | This includes study of aspects relating to improving understanding of media studies, e.g., newspapers (study of), advertising, etc. |
| Other | Describe aspects not covered by other categories to be noted here. |

Notes for Version 4 (23.8.11)
APPENDIX D
Interview questions and prompts

PROMPT SHEET FOR INTERVIEWS WITH TEACHERS

Contextual information required

School:

Teacher:

Age:

Qualified as teacher:

No. of years working with IWB:

Makes of IWB you’ve worked with?

General feedback on working with IWBs

What features of IWBs do you use most readily?

Do you use IWBs for particular purposes?

Commentary on selected images

Show images from lesson. Ask for comment on how and why each image was used
  - Design
  - Purpose
  - Effect
  - Particular value of technology

1.

2.

3.

Training

Outline any training you’ve had to work on IWBs:
### APPENDIX E

An example of a matrix used for framework analysis of interview data

<table>
<thead>
<tr>
<th>Case</th>
<th>Planning using EN/F/PPT</th>
<th>Sharing planning with students</th>
<th>Spontaneous planning</th>
<th>Limitations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abigail</td>
<td>- quick to plan something stimulating to look at (3)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Alice</td>
<td>- routine to allow slides to set up pace and stages of the lesson (5)</td>
<td>- distinguishes between lesson plan and content of IWB which is step-by-step (13)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>- terminology used in lesson plans may be different to that on IWB (16)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Beverley</td>
<td>- increasingly feels that PowerPoint can be used as an effective lesson plan (18)</td>
<td>- makes lesson clear to the students (22)</td>
<td></td>
<td>- with a PowerPoint you don't know what's coming (20)</td>
</tr>
<tr>
<td></td>
<td>- a very good way of organising the lesson (22)</td>
<td></td>
<td></td>
<td>- you need energy to use PowerPoint (22)</td>
</tr>
<tr>
<td>Bill</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bryn</td>
<td></td>
<td>- regularly uses something that was not planned (33)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>- deviates from set plan quite often (34)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cherry</td>
<td></td>
<td>- spontaneous use of saved resources when pupils weren't getting enough out the task (35)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>- prefers to plan at home and therefore uses PowerPoint because of access to it (40)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Deborah</td>
<td></td>
<td>- the titles used in the Notebook for both teacher and pupil (45)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>- uses Notebook file as lesson plan (45)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>- uses it as a prompt on what to say and questions to ask (46)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Research into interactive whiteboard use in English

Headteacher’s consent

School:

Headteacher:

Please choose one of the following options:

a) I have consulted with the English Department and give consent for the department to be involved in this research project.

Signature: ..........................  Date:........................................

b) I do not give consent for involvement in this study.

Reason (if possible):.................................................................................................
......................................................................................................................................
......................................................................................................................................

Signature:........................................  Date:........................................
APPENDIX G  
Teacher consent form  

Information and consent form (adults)  

Project Overview  

Title of Project: a PhD study into the use of interactive whiteboards (IWBs) in secondary English Teaching  

Aims: to gain accurate and useful information about how IWBs are used in secondary English lessons  

Researcher: Judith Kneen, University of Leicester  

Contact details: j.kneen@newman.ac.uk  

Thank you for agreeing to take part in this study. By doing so, you will contribute to a study which hopes to make a significant contribution to the body of evidence available in this area. Your participation will add to the knowledge in this area and will hopefully help English teachers to make more informed decisions about IWB use in future.  

Methods  

Data will be gathered in the following ways:  

1. Classroom observation: a researcher will observe up to 3 lessons to gather information on how the IWB is used, for how long and by whom. The information will be gathered through using a systematic method, by use of a recording form.  
2. IWB content: the researcher will capture and collect the content of the IWB that is used in the observed lesson.  
3. An Interview after the lesson observation will provide the teacher with the opportunity to consider the decisions and choices made with regard to IWB use. The interviews may be transcribed.  

Use of the data  

Data collected in this study will be used in a PhD thesis, in order to advance knowledge and understanding in this area. It may also be used in academic conferences and academic publications.  

Your rights  

This study has gained ethical approval from the University of Leicester. You may be assured that your rights will be respected throughout this study. Your contribution is on a voluntary basis and you may withdraw from this study at any time, without prejudice or challenge. If you withdraw, data collected from you will be destroyed.
Anonymity
All efforts will be made to maintain the anonymity of the school and the participants in this study. Your name will not be used in the report or any other publications.

Data checks
You have the right to read, view, listen to and comment on any of the data gathered from you and your lesson, should you wish to do so.

Security
Any data collected from you will be kept in a secure manner. Digital information will be password-protected and paper copies will be kept in a locked place. Data will be destroyed at the end of this project, after the thesis has been written and results have been disseminated, unless further permission is gained to keep specific details.

Risks
I do not consider that this study poses any substantial risks to you. Possible risks might include: perceived increase in stress from lesson observation; pressure on your time through involvement in interviews; intrusive nature of technology on your teaching. However all efforts will be made, through careful planning and organization, to minimise the impact of these potential risks.

Participant’s understanding and consent
I understand that:

☐ my participation is voluntary and that I may withdraw at any time
☐ the data collected is for research purposes and is not to evaluate me
☐ I will be given opportunities to review and comment on the data collected relating to me
☐ arrangements have been made for the secure storage of the data
☐ every effort is being made to maintain my anonymity
☐ the data will be used for a PhD thesis, and possibly for academic publications and conferences.

I give my consent for:

☐ resources, written by me, to be quoted or used as examples within this study.

I agree to the terms

Participant’s full name: ................................. Date: .........................

Participant’s signature: .................................

Researcher’s signature: ................................. Date: .........................
Research Project in English

Information for pupils (and parents)

The research project
Your school and teacher are taking part in a research project on using interactive whiteboards in English lessons. It will help teachers understand more about using this type of technology.

My name is Judith Kneen and I am PhD student with the University of Leicester, and I am doing the research.

As some of this research takes place in lesson time, I would like you to be fully informed and I am asking for your consent (agreement).

How it affects the pupils

1. You may notice me present, taking notes, in some English lessons.
2. If you have any work on the interactive whiteboard, your work may be used as part of the project.

Security and confidentiality
All the information I collect will be kept in a safe, secure place. All information will be reported anonymously. This means that no names (school, teacher, pupil) will be used. No pictures of pupils will be used in the report.

What happens to the information collected?
Data collected in this study will be used in a PhD thesis. It may also be used in academic conferences and academic publications.

Respect for rights
This study has gained ethical approval from the University of Leicester, which means that it has been organised in a proper way, and with respect for the rights of people involved. I would like you to play a full part in the lessons observed, but you do not have to agree to your work being used. However, if you and your parent/guardian do agree, you will be contributing to an authentic research project.

Please sign the attached form, and ask your parent/guardian to sign it too. Then return it to your teacher.

Thank You

Judith Kneen
University of Leicester
Research Project in English

Pupil’s consent

I agree/do not agree (delete one) to helping in this project.
I agree/do not agree (delete one) to my work possibly being used as part of this project.

Pupil’s name: ..................................................

Pupil’s signature: ..................................................

Date: ..................................................

Parent’s consent

I agree/do not agree (delete one) to my child being involved in this project.
I agree/do not agree (delete one) to my child’s work possibly being used as part of this project.

Parent’s/Guardian’s name: ..................................................

Parent’s/Guardian’s signature: ..................................................

Date: ..................................................

Note:
If you have any questions for the researcher, you can write them below, or you can contact the researcher at j.kneen@newman.ac.uk
REFERENCES


Becta (2006b) *Interactive whiteboards and primary literacy*. Coventry: Becta.


Cogill, J. (2002) How is the interactive whiteboard being used in the primary school and how does this affect teachers and teaching? Available at: www.virtuallearning.org.uk/whiteboards/IFS_Interactive_whiteboards_in_the_primary_school.pdf (Accessed 12 August 2010).


DfEE (2001) *Key stage 3 national strategy framework for teaching English: Years 7, 8 and 9*. London: DfEE.


