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DOCTORATE IN EDUCATION

AN INVESTIGATION INTO DIGITAL TECHNOLOGY AND A CONSIDERATION OF WHETHER IT CAN ENHANCE LEARNING: ONE SCHOOL'S APPLICATION OF DIGITAL TEACHING

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ABSTRACT

The use of digital technology in education is a global concern (Convery, 2009 and Fluck & Dowden, 2011) which touches on many debates: raising attainment (OECD, 2015; and Somekh, et al., 2007); benefits to learning (Andrews & Haythornthwaite, 2007; and Harasim, 2012); effects on children (Beltran, et al., 2008; and Radesky, et al, 2015); mobile technology (Wilshaw, 2012; Bennett, 2015; and Beland & Murphy, 2015); digital native (Prensky, 2001a; 2001b; 2008; 2009; and 2010; and Selwyn, 2009; 2012); digital technology text-books (Mac Mahon, et al., 2016) and student engagement (Wolper-Gawron, 2012; and Gallup, 2013). This study is significant because it considers student and teacher perceptions of digital technology-related practices specifically in relation to a given subject area (Tamim, et al, 2011; and Howard, et al, 2015).

This study was conducted within the realist paradigm; a 'deep' case study approach was used to investigate teachers' and students' perceptions of digital technology influence on teaching and learning, including subject-specific similarities and differences. These perceptions were linked to current and recent debates about new technology. In this study 30 diaries were used to record student and teacher digital technology use during two weeks and 24 interviews were conducted in a Norfolk secondary school.

The outcome from this study is that although there is no strong evidence that the availability of digital technology has led to utopian change, it has caused small yet significant grassroots changes. The ‘big claim' digital technologies: interactive whiteboards, visualisers and iPads have not transformed education as claimed or expected. There has however been an on-going steady incremental improvement in technology use. The ‘game changer’ digital technologies have not been the hi-tech technologies but rather the everyday: YouTube, Internet,

data projectors, presentation software and word processors. This study contributes to the understanding of the digital technology debate which continues today.

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1 INTRODUCTION

1.1 CONTEXT

Digital technology and its use for enhancing teaching and learning within schools (Gu & Ouyang, 2008; Hew & Brush, 2007; and Zhang, et al, 2010) has been high on the education agenda for many years (Aristovnik, 2012, p.1). This is evident from the vast wealth of research within this field: students and digital technology (Prensky, 2001a; Selwyn, 2009; and Crook, 2012); teachers and digital technology (Albion, 1999; Fluck & Dowden, 2011; and Huffman, et al, 2013); reviews of digital technology for teaching and learning (Livingstone, 2012; Scanlon, 2012; and Howard, et al., 2015); and suggested frameworks for digital technology integration (Crook, 2005; Laurilllard, 2009; and Bhatt, 2012). The research has been guided by concerns surrounding digital technology in the field of teaching and learning and there are suggestions that: cutting-edge technology is not being harnessed to transform teaching and learning (Jones & Day, 2009 p.6); there are serious doubts regarding the effectiveness of technology in improving student achievement (McPhail & Paredes, 2011, p.24); and there are few central guiding frameworks or theories for its implementation (Johri, 2011, p.207). The quest to address these concerns and therefore improve the use of classroom digital technology in education has been presented as a worldwide concern (Convery, 2009, p.27; and Fluck & Dowden, 2011, p.1).

There have been dramatic changes in the use of digital technology in schools over the last decade with the expectation that this would make teaching and learning more effective; large investments for the purchase of extensive amounts of hardware and software, increased broadband access and teachers being trained in the use of digital technology in education (DfE, 2012, p.3 and Steffens 2014, p.553). However, despite the growing use of digital technology within schools (Fluck & Dowden, 2011, p.1; and Gu, et al., 2013) – seemingly due to rate of emergence, speed of development, and rate of use which have increased exponentially (Kelly, 2005, cited in Sannino, et al., 2009) – it is still believed by many that teachers, schools and education as a whole are failing to make the most of this new digital technology (Fluck & Dowden, 2011, p.2; Goodrum et al., 2001 and Gove, 2012).

It is believed that schools have been slower to integrate digital technology into their lesson plans than they have been to fit computers into their classrooms (Livingstone, 2012, p.1). Implying that teachers and students use of the technology available to them in their schools and classrooms is by no means perfect and consequently our understanding of educations effective use of digital technology is not yet complete. Schwartzbeck (2012, p.20) states that policy makers and educational leaders have an obligation to take learning to the next level by maximising the opportunities that digital learning and technology offer for all students. This thesis focuses on teachers, students and digital technologies real world use in real world classrooms while considering whether or not digital technology opportunities are being harnessed for transformational teaching and learning with a particular focus on teachers' specialist subjects (humanities, arts, languages, computing or mathematics).

There are several strands to the digital technology education debate including: digital technologies ability to raise attainment (Harrison, et al., 2002; OECD, 2015; and Somekh, et al., 2007); how digital technology benefits learning (Andrews & Haythornthwaite, 2007; and Harasim, 2012); how digital technologies effect children – positively or negatively (Beltran, et al., 2008; Haugland, S.W, 2000; and Radesky, et al, 2015); mobile technologies benefits or detriments to learning (Wilshaw, 2012; Bennett, 2015; and Beland & Murphy, 2015); the relevance and truth behind the digital native (Prensky, 2001a; 2001b; 2008; 2009; and 2010; Crook, 2012; and Selwyn, 2009; 2012); how digital technology can be used as a text book (Mac Mahon, et al., 2016) and increased student engagement via digital technology (Wolper-Gawron, 2012; and Gallup, 2013).

In view of these controversies, one way of testing out these ideas is through a small but 'deep' case study approach, as opposed to the large quantitative studies such as ImpaCT 2 and Testbed project; whose sheer size is thought by some to validate its research outcomes. Similarly, there is belief by some that the only important research is that which shows 'what works', and the only reliable methodology is the randomised control trial (RCT) (Bennett, 2013). It is thought that knowledge in terms of the numbers, which are produced and shared (or rather imposed), are presented as objective, unmediated, unbiased and scientific (Poovey, 1998; Ozga & Lingard, 2007). However, it would be myopic to think that RCT's are the only sound methodology; classrooms are open system which operate in non-linear ways and consist of many individuals, who may have different individual experiences and attitudes but also develop a collective response to what teachers do - what works for one class might not work for another, and what works on Wednesday morning might not work on Friday afternoon (Wrigley, 2016). RCT's though having a large sample size may be thought to be epistemologically flawed due to their neglectful view of a classrooms complexities in which the teacher and students' have differing individual needs and interactions.

Experiments though useful in verifying knowledge, may not in reality advance knowledge, and many important discoveries and intentions have not arisen from experiment or systematic procedures (e.g. penicillin, nylon, superconductivity, aeroplanes) (Wrigley, 2016). There are many other valuable forms of classroom research and evidence, including close observation, recording what students say and do, talking with students about their learning, and case studies which look at the complexity of a particular situation (Wrigley, 2016). A rich, context driven case study was used to investigate the previously outlined digital technology controversies through the lens of school A; via an open dialogue and strong relationships between myself as researcher and the teachers and students within the study and school in which I teach.

Stenhouse (1975) states that curriculum research and development should belong to the teacher and proposals from policy makers are not diktats, but ideas which the teacher should test out in his or her classroom. This is in support of the view that scientific recommendations can only be assessed by their application in practice, whereby teachers are seen as research workers testing out educational theory (Hodkinson, 1957, p.138-9). Practitioner experience is as important as systematic evidence, and must be used in conjunction with it (Sackett, et al., 1996; and Wrigley, 2016); ‘evidence’ should not replace a teacher’s professional judgement (Wrigley, 2016). A small in depth case study though not able to make bold claims and generalisations regarding the issues surrounding digital technology and education; can provide thick descriptions and insights from teachers and students which take account of the complexities of a ‘non-linear’ ‘open system’, classroom setting.

1.2 SETTING

The research was conducted within an 11-19 mixed academy (hereinafter referred to as School A) with 690 students on roll in Norfolk, UK. The school has a much higher than average proportion of students who are known to be eligible for free school meals, and of students who have special educational needs (Ofsted, 2011, p.3). However, the proportion of students from minority ethnic heritages or who speak English as an additional language is well below the national average (Ofsted, 2011, p.3). In recent years Norfolk schools have been associated with underperformance and their students described as unlucky because of low-level disruption, indifference and disengagement (Wilshaw, 2013, p.5).

School A has a digital technology specialism and stipulates in its curriculum policy that the curriculum must be innovative and enhanced throughout by digital technology and it should encourage and support the ethos of research and development, particularly in the use of digital technology (School A 2011). Digital technology is of great importance to the school and large quantities of up to date equipment are available for all students and teachers. Each department and teacher has a different method of employing the digital technology in their lessons as there is no over-arching policy.

School A occupies a new building constructed in 2012 and has access to a vast amount of digital technology available for use throughout the school, including: three Apple suites of 30 iMac desktop computers each; a HP suite of 30 desktop computers; eight trolleys of Apple MacBook Pro laptops; nine trolleys of HP laptops; and ten trolleys of Apple iPad tablets. The devices each have access to high speed Internet and a number of software applications including the Microsoft Office suite, Adobe Creative Suite 6 as well as a range of other educational and creative software programs. The school is split into four faculties and each faculty is made up of a number of subjects. For example, one of the faculties consists of maths, computing, leisure and tourism, and business. Each faculty owns some of the digital technology; the example faculty has access to two HP laptop trolleys, two iPad trolleys, one Apple iMac suite and two MacBook Pro trolleys. Each teacher within a given faculty has access to the faculty's digital technology and an informal booking system exists within each faculty. In addition, teachers from outside the faculty can have access to the digital technology if necessary, however this must be negotiated on a case-by-case basis.

Each teacher is provided with a school issued laptop, either a MacBook Pro or HP laptop depending on their subject area. For example, teachers of Art, Music, Drama and Computing have MacBook Pros and teachers of Mathematics and Science have HP laptops. The initial decision between HP and MacBook Pro was made by the subject leader of each department on the basis of the operating system (Windows vs. Mac OS) and type of software (GarageBand/iMovie/xCode vs. Microsoft Office) that they thought the teachers of their subject would need access to for their lessons.

1.3 AIMS

The aims of this enquiry are to investigate the effect of digital technology on teaching and learning, focussing on students' and teachers' perceptions with a view to connecting the effects of digital technology use in one particular school (School A) to the debates about new technology use in education as described in Section 1.1.

- How exactly are teachers using digital technology in their lessons? What do they think about digital technology and teaching? Are there any subject specific differences or similarities?
- How exactly are students experiencing digital technology in their lessons? What do they think about digital technology and learning?
- What light does new technology use on School A shed on the current and recent debates about the use of new technology in schools? (See Section 1.1 for a brief summary of these debates and controversies).

The intended outcomes are to discover whether digital technology as promoted by government, policy-makers, educational researchers and School A is thought to impact positively on teaching or learning or both at the grass roots level. Ideally this investigation would identify any perceived gaps that may or may not exist between rhetoric and reality with regard to the employment of digital technology within education.

In addition, this investigation looked towards self-presentation and impression management, and the role that these play in teaching and qualitative research. The role in teaching is a question of theoretical and practical interest and relates to the possibility that teachers have multiple identities, which they present to their students, other colleagues and to some degree the school as a whole (see chapter 2.3.1 for a more detailed discussion of these ideas). The role in qualitative research is a question of methodological interest and builds upon the idea of multiple identities and the pertinacity for individuals (teachers) to lie in order to maintain those identities. Is a teacher's presentation of self their true self? Can the data collected be trusted or has it been subject to impression management? Is there the possibility that individuals (in this case, in particular, teachers) might not accurately represent the reality of ICT use and its impact?

This study is significant because it considers the perceptions of the individuals (students' and teachers' views are considered in equal weighting due to their identical sample sizes) for whom digital technology is not just an optimistic solution to all of educations apparent problems but a reality they must live with on a daily basis. The impact of digital technology depends on both the teachers and students who use it (Gu, et al, 2013, p.392). This research extends current knowledge by considering how digital technology is employed to support the teaching and learning of a wide range of subjects (arts, humanities, languages, computing and mathematics). There is research to suggest a specific need for empirical work examining technology-related practices and the role of digital technologies in subject areas (Scheuermann, et al., 2010; Tamim, et al, 2011; and Howard, et al, 2015). Amongst other strands of enquiry, this research scrutinises teachers' perceptions of applications such as interactive whiteboards and visualisers for teaching and learning. Teachers' views about enhanced teaching with the use of interactive whiteboards is rarely encountered in the literature (Cakiroglu, 2015, p.252) and very little research regarding any aspects of visuliasers could be found. The investigation has implications for the teachers, the students, School A, and also, to a lesser extent, the education community as a whole for whom digital technology plays a key role in modern teaching practices.

1.4 RATIONALE FOR RESEARCH APPROACH

This section contains a very brief overview of the research approach, methodology and methods employed as part of this investigation; these ideas are developed in more detail in Chapter 3. The realist paradigm was chosen because the teachers and students perceptions could be seen as a window onto the blurry external reality of digital technologies effectiveness for teaching and learning (Sobh & Perry, 2012, p.1199). The teachers, students and digital technology were all considered to be interacting “subjects” through which an understanding of the shared reality could be sought; albeit one particular imperfect and probabilistically apprehensible view of reality (Guba and Lincoln, 1994; Tsoukas, 1989; and Merriam, 1988). Therefore, this investigation was designed to develop a range of themes or “family of answers” to take account of several interrelated contexts and different students and teachers views (Pawson & Tilley, 1997, p.152) so as to best understand the reality of this study.

A case study methodology (see chapter 3.2) was chosen for its ability to investigate a contemporary phenomenon (teaching and learning with digital technology) within its real-life context (School A) when the boundaries between phenomenon and context are not clearly evident and in which multiple sources of evidence are used (Yin, 1984, p.23). The case study comprised a combination of four case selection methods (deviant, intrinsic, instrumental and convenience), see chapter 3.2.1 for more detail. Two data collection methods were used: two rounds of diaries which collected both qualitative and quantitative data (chapter 3.4.1) and one round of semi-structured interviews/focus groups (chapter 3.4.2). This was necessary for triangulation of the data; and also provided three different contexts during which the data could be collected. The quantitative data was presented using descriptive statistics and the qualitative data was analysed using thematic analysis.

1.5 STRUCTURE

This thesis presents the results of a study evaluating the use of new technology within modern secondary teaching and learning, and the extent to which current and future use might improve educational outcomes in schools. Chapter 1 explains the context behind the study and provides an introduction into the debates that will be investigated. Chapter 2 outlines the main aspects of the digital technology debate by presenting a review of the literature. This chapter includes a wide-ranging overview of the educational context surrounding digital technology in schools. The review concentrates on two aspects of digital technology use: digital technology as used by teachers and digital technology as used by the students. The former includes an assessment of the influential factors which can promote or hinder teachers' use of digital technology and an analysis of how digital technology is used by teachers. The examination of students' use included mobile technology in the classroom, an appraisal of the term 'digital native' and a consideration of the effects on attainment.

Chapter 3 presents the methodological basis of the study, including its epistemological context and an in-depth explanation of the case study methodology including its design, the sample and generalisation. The data-collection methods used: diaries and interview/focus groups are examined. Aspects of ethics and the thematic data analysis and thematic analysis maps are covered. Chapter 4 in turn deals with a description of the findings from the data which emerged from the interview/focus groups and diaries. Chapter 5 is a critical discussion of the findings which are structured to mirror the thematic analysis map presented at the start of Chapter 5. The final chapter consist of a summary of the study, an outline of the main conclusions and reflections, including improvements and areas of further study.

2 LITERATURE REVIEW

2.1 DIGITAL TECHNOLOGY AND TEACHERS

One of the principal themes that recurs throughout the digital technology research literature incorporates two strands: the first is the assumption that the use of digital technology is beneficial to teaching (DFE, 2011, p.3; DFE, 2012, p.15; Domingo & Garganti, 2016, p.27; Downes, et al., 2002, p.11; Helsper & Eynon, 2009, p.516; Huffman, et al., 2013, p.1783; Livingston, 2012, p.3; OECD, 2015, p.52; Selwyn, 2009, p.366; and Somekh, et al., 2007, p.17); the second is the limited evidence to support this assumption (Coleman, 2011, p.7; Convery, 2009, p.15; Crook, 2012, p.4; DfE, 2011; and Steffens 2014) or any blame for reluctance to use it by teachers (who fail to see the “obvious” educational value in their classrooms) is the fault of the teachers (Albion, 1999; Cavenall, 2008; Cummings, 1996; Gove, 2012; Harrison, et al, 2002; Perrotta, 2013 and Wilkan & Molster, 2011). In contrast to these ideas Convery (2009, p.35) suggests that the “blaming” of teachers is a result of unrealistic expectations of digital technology by researches who are “believers” in it, and it is these “believers” who inhibit teachers’ pragmatic attempts to integrate digital technology in a classroom context.

Säljö (2010, p.55) notes that the rhetoric of seeing technology as developing and providing solutions, and the education sector as slow to make use of them, is far too simplistic and does not account for a changing interpretation of what learning is. The suggestion that teachers’ resistance to change regarding digital technology could be related to the UK’s standardised testing; it follows that teachers teach in a traditional way because their students are still tested in a traditional way. Mason (2010, p.96) identifies this ‘Catch 22’ of UK education policy: teachers are enjoined to use ICT, but the government has instituted standardised testing of young people based on traditional skills which exclude most ICT benefits. Teachers are merely trying to respond to government assessment policies (Mason, 2010, p.96). Säljö (2010, p.56) extends this argument by noting that most accountability systems of student performance use paper-and-pencil tests in which digital resources are not allowed, therefore it is pertinent to question whether investment in digital tools will result in higher achievement. Loo (2015) identifies video games as an alternative to traditional testing methods; they can offer highly detailed statistics in real-time; collect data every step of the way and offer context for a child's development and specific learning habits. Thus enabling a deeper understanding of how the students are actually interacting with the material, and allowing teachers to give immediate feedback.

There is a concern that digital technology is employed by teachers in specific socio-economic conditions to support less academic forms of provision, specifically when socialising "difficult" students and to minimise disruptive behaviours; this practice might illuminate why digital technology historically has not "transformed" pedagogies and the "core" nature of instruction (Perrotta, 2013, p.323). Haydn (2003, p.13) states that the general enthusiasm for new technology in some quarters has perhaps led to the assumption that because ICT is good for booking holidays, sending messages and formulating accounts, it is equally good for teaching and learning (in all subjects), without looking closely at what it has to offer, both for learning in general and in relation to particular subject disciplines. Integration of technology use is also about the specificities of subject area, content being taught and affordances of digital technologies to support learning in these contexts (Howard, et al., 2015, p.25). A teacher's subject area may be an important variable, which can affect how much digital technology they want to use in their teaching. A particular area of concern for many teachers continues to be how digital technologies are most effectively integrated in their subject area (Hennessy, et al., 2005; Perrotta, 2013; and Warschauer, et al., 2011). However, there have been relatively few studies investigating technology integration in specific subject areas (Howard, et al., 2015, p.25).

Further explanation for the lacking evidence regarding the benefits of digital technology include over-enthusiastic technologist evangelists, learning theorists and profit seeking commercial interest (Selwyn, 2012, p.13) that presents research while under pressure from monetary, political and commercial investment (Fluck & Dowden, 2011, p.8). There is a growing awareness of the gap between promises made by ICT evangelists and what novices may actually experience (Crook, 2005, p.513). Hennessy, et al. (2005, p.268) and Mayes (1995) state that much 'evidence' presented in policy statement tends to be selective, idiosyncratic and 'not necessarily generalisable to the typical classroom' and is driven more by hype and excitement than by evidence or theory. According to Convery (2009, p.34) researchers may be more prepared to accept an individual indicative event as being a herald of inevitable change; while Tapscott (2009, p.368) asserts that popular press-writers make broad recommendations for changes in the school systems and curricula, supporting their claims mainly with anecdotal evidence or proprietary data that is not available for scrutiny. Those closer to the educational process have been more circumspect about claims made, particularly those who have a background in education *and* ICT (Haydn, 2003, p.13).

When the blame is not aimed at teachers it is focussed on schools. Heppell (2010) has argued that UK schools have tended to respond conservatively to new technologies rather than embracing and exploiting them and that less defensive approaches are needed in order to fully realise the learning potential of ICT. Somekh (2008) makes the point that teachers are not 'free-agents'; their use of ICT for teaching and learning depends on the 'inter-locking cultural, social and organisational contexts in which they live and work'. Perrotta (2013) expands this idea of organisational effect by identifying particular school leadership characteristics as being synonymous with reported digital technology benefits. Teachers who perceived their school leadership to be supportive of innovative practice were also more inclined to report benefits (Perrotta, 2013, p.319). The message for management, is to take a holistic and long-term approach to identifying the many different impact factors that need to be taken into consideration when managing for an effective implementation of new learning technology initiatives (Buchan, 2011, p.170).

The idea that too much effort and money has been put into the purchase of more and better digital technology rather than into the use of this technology within the classroom is prevalent (Bennett & Oliver, 2011, p.179). There is a need to balance this by shifting the focus of academic research onto the use of digital technology in practice, as used by ‘ordinary’ teachers day to day. A number of frameworks (TPACK, Socio-material bricolage, Socio culturalism, Socio constructivism, Conversational framework, Actor-network theory, Determinist framework and Australian framework) which focus on digital technology use in practice are discussed in the Frameworks and Theories section (Chapter 2.3). Brooks (2012, p.8) suggests that significant emphasis should be placed on the use of learning technologies to support pedagogies. Without well though-out policies that consider quality, the importance of teaching, and the experience of the student, the current fragmented efforts will produce no better results than reform efforts of the past decades (Schwartzbeck, 2012, p.20). Although it is vital to relate the use of new forms of technology to what is known about effective pedagogy (Mercer, et al., 2010, p.196) Laurillard (2009, p.12) notes that it important to define the pedagogical challenges to technology if it is to be driven towards what learners need, rather than simply trying to exploit what business and leisure markets create.

2.1.1 INFLUENTIAL FACTORS

Due to the scarcity of empirical evidence unequivocally supporting the benefits of digital technology in teaching and the suggested lack of enthusiasm on the part of some teachers using that digital technology a number of barriers have been identified in the wealth of literature surrounding these issues. The barriers include: a negative effect on workload with little educational value for time and effort expended (Li, 2007, p.392; and Wang, et al., 2014, p.652); difficulty integrating technology into regular curriculum and instruction (Li, 2007, p.379); lack of specific knowledge and skills about technology integration, attitudes and beliefs towards technology (Gu, et al., 2013, p.393); poor access to facilities, limited encouragement in some subject specialisms, the pedagogical beliefs of existing teachers regarding the use of ICT in teaching (Hyde & Edwards, 2011, p.84 and Teo et al, 2007; Hermans et al, 2008; and Teo, 2009); age, financial differences, professional development, technical assistance (Kennedy, et al., 2003; Cho, et al., 2003; Hargittai, 2002; and Levin and Arafeh report, 2002); gender (Coffin & MacIntyre, 1999; Compton, et al., 2003; and Huffman, et al., 2013, p.1782); computer hassle (e.g. slow download time or complicated software), motivation (Huffman, et al, 2013, p.1781); level of confidence (Hyde & Edwards, 2011, p.86; and Gu, et al, 2013, p.393); negative attitudes, inherent resistance (Gu, et al, 2013, p.393); lack of time (Haydn, 2001); and school and student factors (Groff and Mouza, 2008).

A number of these barriers have been subsequently found to have little effect. The IEA's 2006 SITES (Second Information Technology in Education Study) survey of 35,000 teachers in 22 countries found no correlation between pupil-computer ratio and use of ICT in classrooms (Law et al, 2008). A separate study undertaken by Perrotta (2013, p.326) found that variations in the benefits of digital technology are not patterned by individual teacher characteristics (age, gender, teaching experience and subject specialism). Fluck & Dowden's (2011) online survey of 49 pre-service teachers' beliefs about ICT in schooling found that neither the teachers' age nor the age at which they first used a computer in the classroom significantly correlated with expected future teaching with computers. However, they found some support for Hermans et al's (2008, p.1504) claim that men are slightly keener to use computers.

Li (2007) conducted a qualitative mixed method study, with two data sets (15 teachers and 575 students) from two urban schools and two rural schools in Canada. Li (2007, p.390) concluded that the majority of teachers thought technology should be used only when necessary and were cautious about the possible negative effects brought about by rich technology use (e.g. teachers and students overwhelmed by technology). Furthermore, the teachers' willingness to integrate technology was closely related to their comfort level in a number of areas: teaching; the technology itself; the students [9 out of 15 teachers would use technology only for strong students]; and the content [teachers must be comfortable with the subject that they are teaching]. Li (2007, p.391) noted that most teachers perceive technology integration as no more than an extra burden on both teachers and students; with little educational value for time and effort invested. It is entirely reasonable for teachers to question whether they should continue to employ digital technology if in their own experience; it has not enhanced their teaching. This view is supported by the Office of Educational Research and Improvement (1993; and Fluck & Dowden, 2011, p.5), which states that teachers are only motivated to tackle the challenges of integrating ICT when they can clearly envisage how it will improve teaching and learning. However, Haydn (2003. P.14) points out that the principal concern of teachers in relation to new technology is whether it will help them to teach their subject effectively. There are perhaps subject specific differences in the perceived usefulness of digital technology and therefore differences in subject related digital technology use.

Finally, Li (2007, p.392) identifies a concern of many teachers that technology may replace them. The fear of being replaced by computers is suggested as being a contributing factor to teachers' reluctance in using technology. A growing number of educators share a similar view by supporting the assertion that social media are set to disrupt (and ultimately replace) the school, college and university altogether (Selwyn, 2012, p.6). There are others though, such as Haydn (2003 & 2012), who note that despite the claims made by 'techno-fundamentalists', suggesting that computers would remove the need for educational establishments, many schools and classrooms today do not function in ways radically different to those of the past.

2.1.2 USES OF DIGITAL TECHNOLOGY

Teachers have changed their pedagogy in response to digital technologies availability in their classrooms (Hyde & Edwards, 2011, p.83). Wise, et al. (2011, p.120) note that this has been done in a number of ways: shifting from instructivist to constructivist educational philosophies; a move from teacher-centred to student-centred learning activities; shifting focus from local resources to global resources; increasing complexity of tasks and use of multimodal information. The DfE (2011, p.3) in support of this pedagogical change advocate the adoption of a style of learning that is less about consuming knowledge and more about interaction and participation. Although digital technology is said to enable a new way of teaching (DfE, 2012, p.7), there are many who believe that when teachers employ digital technology it is mostly at a logistic or admin level (planning and recording assessments), rather than for teaching and it has not changed pedagogy or practice (Cuban, 2001; Cuckle, et al., 2000 and Laurillard, 2009, p.7). Researchers have split the use of digital technology into categories: lesson preparation, professional emailing, grading, delivering instruction, student use, student products (Bebell, et al., 2004), preparing hand-outs, student Internet use (Bebell, et al., 2010), professional development, engagement and motivation, improving comprehension, higher order thinking skills and improving students' IT skills (Ottenbreit-Leftwich et al., 2010).

Laurillard (2009, p.7) notes that while websites and podcasts appear to be exciting for education, in terms of supporting the learning process, they play exactly the same role as conventional books and lectures; presenting the teacher's concept. Students' use of web 2.0 technologies (blogs, wikis and virtual worlds) is low (Jones, et al., 2010; and Hinostroza, et al., 2011). However, there are some who believe that changing teachers' pedagogy is less important than trying to understand the realities of how digital technology has transformed learning in our schools. Selwyn (2009, p.374) notes that many children and young people will still continue to require support [from teachers] in the creation and communication of content, with many still lacking experience, confidence and motivation to be involved in the process of designing, implementing and evaluating self-created content (Selwyn, 2009, p.374). There is some fear that the teacher as facilitator and a focus solely on peer-to-peer learning rather than formal provision would be an unwise move. Learners cannot actually “construct” their own learning (because, in Foucault’s pithy phrase, they cannot know what they do not know) (Young and Muller, 2009, p.17).

However, some evidence which serves to illustrate that change has started, albeit in a small way, does exist. The work of Bereiter (2002) and colleagues illustrates the imaginative use of ICT, which has allowed classroom science to be re-mediated as authentic and collaborative forms of “knowledge building”. Traditional teaching beliefs were superseded by participatory and constructivist principles. Wise, et al. (2011, p.131) describe a small study in which teachers were not only using technology to ‘serve’ tradition but also to enhance the learning experience of their students, at times with, according to the teachers’ accounts, quite dramatic results. An interesting point arising from research of this type is that despite evidence that digital technologies have begun to transform teachers’ pedagogical approaches, they themselves do not see the shift as being particularly marked (Wise, et al., 2011, p.130). There may be a divide between what researchers consider transformation and what that term means to teachers. This could explain the discrepancy between the technologists’ and the teachers’ views. Teachers are believed to focus more on the practical aspects of technology use in terms of feasibility, availability and value added (Dornisch, 2013, p.210). Teachers feel the real transformation has been their ability to use ICT in ordinary classrooms without trekking down to the ICT suite… and being able to share and build up collections of powerful resources very quickly through the use of ICT (Haydn, 2010, p.58).

2.2 DIGITAL TECHNOLOGY AND STUDENTS

In striking contrast to some teachers' apprehension when employing digital technology as part of their teaching, students' enjoyment of learning with digital technology is widely reported (Crook, 2012, p.63; Dornisch, 2013; Empirica, 2006; Guerrero, et al., 2004; Passey, et al., 2004; Li, 2007 and Zoller & Ben-Chain, 1996). The results of Li's study (2007, p.392) confirms the conclusion of Guerrero, et al. (2004) that teachers' attitudes towards digital technology tend to be negative, while student attitudes can be summarised as enthusiastic. Students' attitudes were mainly reflected in their comments from four perspectives: technology increased efficiency; improved pedagogical approaches; preparation for the future; and increased motivation and confidence (Li, 2007, p.387) by making schoolwork more enjoyable (DfE, 2011, p.16).

The Eurobarometer Benchmarking Survey carried out in 2006 in 25 European Union Member States, Norway and Iceland found that 86% of teachers affirmed that students are motivated and attentive when computers and the Internet are used in class (Empirica, 2006, p.24). Similarly, a quantitative survey conducted by Passey, et al. (2004) demonstrated the existence of highly positive motivational characteristics. Zoller & Ben-Chain (1996) concluded that students, more than teachers, consistently rated themselves as having more positive attitudes and comfort levels when working with computers, as well as a greater belief in the importance of computers and the educational benefit. Dornisch (2013, p.224) reinforces this point, noting that both teachers and students recognise that students are more easily motivated when technology is effectively integrated into the curriculum. However, digital technology, when employed in direct relation to learning, is more commonly associated with lower order factors such as motivation rather than higher order thinking such as deep learning. Perrotta (2013, p.326) describes how the nature of digital technology benefits would appear to pertain more to the organisational processes of engaging students with learning activities, rather than the intellectual processes of learning itself. This is supported by Kimber & Wyatt-Smith (2010, p.609) who note that when young people are frequent users of new technologies and teachers have incorporated activities like online discussion forums, there has been minimal evidence that much higher order thinking has been exercised.

The evidence of students' positive views on technology is questioned by the students in Galbraith & Haines' study (1998) who view technology as an enhancement to the learning process rather than a substitute for it. The study found that not all students were confident in the use of technology, nor were many convinced of the benefits of technology-based instruction. In support of this more negative student view D'Souza & Wood (2004) found that students generally had a mistrust of software and felt more comfortable with their "tried and true" traditional methods. Some of the students cited the irrationality of using computers for in-class work but being tested via pen and paper methods. Crook's (2012, p.63) study identified students who found that the use of social media in their teaching could be: stressful ('Encarta syndrome', pupils print off large chunks of digital resources without reading and assimilating the content (Haydn, 2003, p.20)); frustrating (institution controlled blocking of potentially offensive or distracting materials); threatening (uncertainty over personal safety); or devious (practise of cut-and-paste leading to issues of dishonesty and legitimacy).

Boyd's ethnographic study of social networking notes two types of non-participants: disenfranchised teens and conscientious objectors. The first are those without access, the second are those who object to the corporations behind the sites; those who agree with their parents' moral or safety concerns; or those who feel they are too cool or not cool enough to use them (Boyd, 2007, p.3). This study highlights the idea that there are more reasons than simply access [to the technology or to the Internet] for students not using social networking and as a possible extension digital technology as a whole. Hargittai's

(2008) study of university students found that a significant amount (12%) did not use social media despite having access and being aware of it.

Griffiths (2002, p.51) states that there has been considerable success with games [for education] when they are designed to address a specific problem or to teach a certain skill. More recently this rather limited claim has been amplified; a number of recent studies have indicated that video games, even violent ones, can help kids develop essential emotional and intellectual skills that support academic achievement (Loo, 2015). However, the assertion that the impact of violent computer games is not a concern is contradictory to other research (Griffiths, 1998; and Griffiths, 2002, p.49). Loo's (2015) bold statements could be thought of as being supported by hype rather than evidence; implementing digital games in the classroom has already yielded "amazing gains" (Loo, 2015). A more tentative and perhaps realistic claim would be that videogames (in the right context) may be a facilitatory educational aid (Griffiths, 2002, p.48).

In contrast to the positivity surrounding video game use for education is the evidence from the National Children's Bureau Northern Ireland research study (ICT and Me) which, found that 41% of children who used portable gaming devices twice a day achieve five GCSE A* to C grades grades, compared with 77% of those who used them less than once a week; the research did not establish why this might be the case (Meredith, 2015). However, it could simply be the case that videogames can clearly consume the attention of children and adolescents (Malone, 1981). This view is supported by Griffiths (2002, p.51) who notes that the empirical literature describes negative consequences of playing games almost always for people who are excessive users of videogames (Griffiths, 2002, p.51). The opposing viewpoints of the research could suggest that if used with caution (care should be taken that enthusiastic use of this technique does not displace other more effective techniques) videogames could represent one technique that may be available to the classroom teacher (Griffiths, 2002, p.50).

2.2.1 MOBILE TECHNOLOGY

Several studies have found that students who text, or use other technologies in class, are generally outperformed by those students who abstain from these behaviours which decreases learning, task completion and can negatively impact student learning (Ophir, et al., 2009; Kraushaar & Novak, 2010; Rosen, et al., 2011, Smith, et al., 2011; Wei, et al., 2012; Wood, et al., 2012; Kuznehoff & Titworth, 2013; Levine, et al., 2013; and Lee, et al., 2014) and some studies have found that multitasking is distracting for those students seated around the multitasker (Sana, et al., 2013). Beland & Murphy (2015, p.2) support this view and note that mobile phones can be a source of great disruption in classrooms as they provide access to texting, games, social media and the Internet which have the potential to reduce the attention students pay to classes and can therefore be detrimental to learning. Bennett (2015) describes how lessons are disrupted by the temptation of the smartphones in the students' pockets that offers instant entertainment and reward, easily distracting them from their work. This debate is also supported by Wilshaw (2012) who states that disruption during lesson times is often down to the use of mobiles and that issue has to be stamped out. Mobile technology, particularly student personal mobile devices is an important and pertinent area of debate in current education.

Domingo & Garganté (2016, p.21) describe the worldwide popularity of mobile technology by students from all levels of education (Dhir, et al, 2013; and Kinash, et al., 2012). However, the use of mobile technology does not diminish when students walk into a classroom (Kuznekoff, et al., 2015, p.347), students are physically present, yet mentally preoccupied by non-course related material on their mobile devices (Kuznekoff, et al., 2015, p.344). Junco and Cotton (2012, p.511) found that engaging in Facebook use or texting while trying to complete schoolwork taxes the student's limited capacity for cognitive processing and precludes deeper learning. Any distraction, regardless of number, can result in poorer performance than no distraction (Wood, et al., 2002). The students themselves report lower levels of attention and decreased perceived learning when they actively text in class (Wei et al., 2012); there has been unequivocal condemnation of mobiles in recent literature (Wilshaw, 2012 and Bennett, 2015).

These findings do not discount the possibility that mobile phones could be employed as a useful learning tool if their use is properly structured (Beland & Murphy, 2015, p.17). Some instructors have capitalised on nearly ubiquitous information access, and used these strategies for potential learning gains (Kuznekoff, et al., 2015, p.345). Findings suggest that facilitating access to information and increasing engagement with learning are the two main impacts of mobile technology in the classroom (Domingo & Garganté, 2016, p.21). Teaching strategies that integrate students' use of mobile devices should be commended, it is reasonable to hypothesise that appropriate use of mobile devices will keep students engaged and will therefore likely have positive learning outcomes (Kuznekoff, et al., 2015, p.348).

Beland & Murphy (2015, p.2) found that following a ban on phone use, students test scores improved by 6.41% of a standard deviation, however there are no significant gains in student performance if a ban is not widely complied with. Furthermore, this effect is driven by the most disadvantaged and underachieving students with students in the lowest quartile of prior achievement gaining 14.23% of a standard deviation. The results suggest that low-achieving students are more likely to be distracted by the presence of mobile phones, while high achievers can focus on the classroom regardless of the mobile phone policy. The results indicate that a mobile phone ban has a positive and significant impact on Free School Meal (FSM)-eligible and Special Educational Needs (SEN) students, the most at-risk students gain the most (Beland & Murphy, 2015, p.13). Banning mobile phones could be a low-cost way for schools to reduce educational inequality (Beland & Murphy, 2015, p.18). There is still uncertainty and discussion surrounding the perceived advantages and disadvantages of mobile technology and other ICT applications (tablets, apps, interactive whiteboards etc.) – the evidence base is inconclusive – hence one focus of this research is to provide further insight into these issues.

2.2.2 DIGITAL NATIVES

Selwyn (2003) states that from the 1970s' and onwards phenomena of the "computer hacker" and "video gamer", perceptions of omnipotent young computer users have been instrumental in shaping public expectations and fears concerning technology and society. Thompson (2013, p.12) explains how because students' lives today are saturated with digital media at a time when their brains are still developing (when neural plasticity is high), many popular press authors claim that this generation of students thinks and learns differently than any generation that has come before (Prensky, 2001a; Oblinger and Oblinger, 2005; Palfrey and Gasser, 2013; and Pedró, 2007). "Digital natives" are used to receiving information quickly, parallel processing, and multitasking; they prefer random access and function best when networked (Johnson, et al., 2011; Prensky, 2001a; Tapscott, 2009; and Thompson, 2013). Teachers entering the profession however are unlikely to have experienced extensive use of digital technology during their own schooling but find themselves teaching this 'net generation' (Fluck & Dowden, 2011, p.1; and Gu, et al., 2013, p.392). Students have higher levels of skill, sophistication, comfort and knowledge with respect to technology than do their teachers (Akçayir, et al., 2016, p.435**;** Dornisch, 2013, p.210; and Gu, et al, 2013, p.392). The idea of the digital native has been used to explain the perceived technology gap that exists between students and teachers.

The digital native has also been used to promote a shift in pedagogy to cope with the digital native's learning style; however, skills such as multi-tasking may have a negative impact on learning due to cognitive overload (Hembrooke & Gay, 2003) and some worry that the new generation of student may be incapable of deep learning and productive work (Bauerlein, 2008). Others take an optimistic view of the skill set these learners are developing but claim that educators are failing them by not adapting instruction to their needs (Prensky, 2001b, p.442, 2001c; Rosen, 2010 and Tapscott, 2009, p.368).

While the term ‘digital native’ is popular, the academic research in this area and evidence to support these claims is limited suggesting that young people are not as radically different in the ways they use and process information as suggested; therefore, researchers caution that our knowledge of neural plasticity alone is not enough to explain learning or to support prescriptive advice for teaching (Bennett et al, 2008; Bruer, 1998; Helsper & Eynon, 2010 and Selwyn, 2009). Selwyn (2009, p.370) argues that the claims, over the innate skills and abilities of young people are rarely grounded, if at all, in rigorous, objective empirical studies conducted with representative samples. He warns of the pressing need to develop and promote a realistic understanding of young people and digital technology if teachers are to play useful and meaningful roles in supporting current generations of young people (2009, p.366). This is supported by Helsper & Eynon’s (2010, p.503) study, which provides evidence that generation is only one predictor of advanced interaction with the Internet (Bennett & Maton, 2010; and Brown & Czerniewicz, 2010); breadth of use, experience of digital technology, gender and educational levels are also important. The evidence also suggests that it is possible for adults to become digital natives, especially in the area of learning, by acquiring skills and experience in interacting with digital technologies. This is in support of Tapscott (1998) who defines a digital native by their exposure to, or experience with, technology rather than by their date of birth.

Popular press writers often describe the digital native as being naturally fluent with a variety of digital technologies. However recent research has challenged this characterisation (Clark, et al., 2009; Guo, et al., 2008; Hargittai, 2010; Kennedy, Dalgarno, et al., 2008; Kennedy, Judd, et al., 2008; and Margaryan, et al., 2011). There are significant differences in how and why young people use these new technologies and how effectively they use them (DiMaggio & Hargittai, 2001; Facer & Furlong 2001; Livingstone & Helsper, 2007 and Hargittai & Hinnart, 2008). For example, research studies suggest that young people’s abilities to access digital technologies remain patterned strongly along lines of socio-economic status and social class, as well as gender, geography and the many entrenched “social fault lines” which remain prominent in early twenty-first century society (Golding, 2000). More recently, even Prensky (who originally coined the term) has changed his view to indicate that not all young people can be referred to as digital natives and that the distinction between digital natives and digital immigrants has become less relevant (Prensky, 2009). Crook (2008) refers to the exaggeration of digital fluency among young people and evidence suggests that engagement [in digital technology] is biased towards consumption rather than production (Horrigan, 2007; and Wang, et al, 2014, p.653).

It is worth suggesting that the widespread use of the term digital native does not necessarily contribute to understanding the use of digital technology in the classroom. This terminology potentially infers an unbridgeable chasm between native and digital immigrant by virtue of these groups being two distinct, dichotomous generations (Helsper & Eynon, 2010, p.515). The problem that arises is that teachers and students will almost always be of different generations: how then can this so-called chasm be bridged, if at all? Prensky’s terminology fails to consider that this inferred chasm can be bridged through other means; for example, experience of digital technology or educational level (as referred to by Helsper & Eynon, 2010, p.503), rather than simply generational difference. The differences between digital natives and digital immigrants have been exaggerated (Guo, et al., 2008, p.251). Indeed, Helsper & Eynon go on to state that underlying assumptions arising out of Prensky’s terminology could negatively impact upon perceived possibilities of teacher-student interactions (2010, p.518).

There is concern regarding how digital technology is used by the students at home and how it is used at school. Prensky and others claim that students employ well developed productive learning habits, attitudes and behaviours in their leisure activities with digital technology but that these skills are being ignored and squandered in their school learning (Thompson, 2013, p.14). There is thought to be a gap between the varied ways in which computers may be experienced at home and the narrow range of use they may attract in the classroom (Crook, 2005, p.514). Researchers investigating young people's screen based literacy practices have noted a dissonance between their "engagement" at home and at school (Buckingham, 2008; Ito, et al., 2008 and Jenkins, 2006); and access at home and at school (Russell, et al, 2003; and Pedró, 2007). In contrast to this wealth of evidence the findings of a study (survey data of 388 university freshmen) indicate that students may be using a narrower range of technology tools than the popular press authors claim, and they may not be exploiting the full benefits of these technology tools when using them in a learning context (Thompson, 2013, p.23). This view is supported by Selwyn (2009, p.372) who notes the mounting evidence that many young people's actual uses of digital technologies remain rather more limited in scope (game playing, text messaging and retrieval of online content (Crook and Harrison, 2008; Luckin et al., 2009; Lenhart et al., 2007; Wang, et al., 2014; and Selwyn, 2006)) than the digital native rhetoric would suggest.

Recently, Prensky (2008) has argued that the permanent state of technical immersion and dependence is encapsulated in the lifestyles of upcoming generations of "i-kids", who remain plugged into portable personalised devices such as mobile telephones, mp3 players and handheld game consoles. In appreciation of how successfully students are thought to employ digital technology in their home lives some schools are beginning to explore the educational potential of social networking sites and mobile phones given the ubiquity of pupil use of these technologies and the shift in cultural literacy towards texting as a form of communication (JISC, 2008). This move is supported by Bhatt (2012, p.298) who notes that allowing learners' personal digital literacy practices (social media and mobile devices) to be mobilised as resources, either explicitly by them or encouraged and guided by pedagogical approaches, can be supportive to learning. However, a number of commentators warn against attempts to motivate and engage young people simply through the introduction of consciously ‘trendy’ forms of social media technology (Selwyn, 2012, p.10), social media often operates in ways that are distinctly opposed to educational rhetoric (Selwyn, 2012, p.12). When it comes to importing tools from everyday settings into a more structured context, there will be various possibilities for the ‘fit’ between them (Crook, 2012, p.4). Even though the use of social media at home and in school may seem to be the same it can in fact be very different (different demands leading to very different outcomes). However, it would be a mistake to presume that learners are always enthused or motivated by the use of social media (Selwyn, 2012, p.10). This study will test the idea that students are necessarily enthused and motivated by ICT influenced teaching and learning approaches. Another strand of this enquiry will be to look into teachers’ perceptions of their students as so called ‘digital natives’; in addition to exploring the reality of the technology gap that is thought to exist between the ‘digital native’ students and their ‘digital immigrant’ teachers.

2.2.3 ATTAINMENT

There is still a strong belief that technologies do not merely support learning; but transform how we learn and how we come to interpret learning (Säljö, 2010, p.53 and Bhatt, 2012, p.298). However, as with digital technology's causal benefits to teaching, there is little empirical evidence to support digital technology's causal benefits to learning (DfE, 2011; Johri, 2011; Säljö, 2010; Steffens 2014 and Sternberg & Preiss, 2005). Solid evidence confirming that the introduction of computers produces significant improvements in academic performance seems to be hard to find (Sternberg & Preiss, 2005, p.14). DfE (2011, p.2) acknowledges the difficulty in establishing causality on attainment due to a number of variables that are impossible to control in a school environment and Johri (2011, p.207) makes the much bolder claim that there is scant evidence that digital technology can improve teaching and learning. Computers and digital devices in their own right do not necessarily improve educational practices, and if they do this is not in a uniform manner (Säljö, 2010, p.55). There is no linear relationship between ICT use and achievement (Steffens 2014, p.561). Contrary to the belief regarding the positive effects of digital technology in schooling is a concern that there is actually little evidence to support these theories.

Despite this apparent lack of evidence there are many claims that digital technology can improve standards (attainment). DfE (2012, p.5) identify head teachers in a small-scale study of 15 secondary schools in England and Wales as establishing a direct link between effective use of technology and improvements in standards. Two large studies (ImpaCT2 study and Test bed project) found there were small but statistically significant positive relationships between the use of ICT and achievement (DfE, 2011, p.2). US studies have correlated home computer ownership and Internet use with academic performance, particularly reading performance (Jackson et al., 2006 and Roberts et al., 2005). Computer access (but not computer games) at later ages has also been associated with increased traditional literacy (Bittman, et al., 2011, p.172).

ImpaCT2 a major study carried out between 1999 and 2002 involving 60 schools in England was designed to find out the degree to which digital technologies (use of ICT) effect the educational attainments (National Tests and GCSEs) of pupils at Key Stages 2, 3 and 4 (Harrison et al., 2002, p.2). Harrison et al. (2002) concluded that in every case except for one the study found evidence of a positive relationship between ICT use and achievement. In some subjects the effects were not statistically significant and were not spread evenly across all subjects. In none of the comparisons was there a statistically significant advantage to groups with lower ICT use. There is evidence that digital technology can enhance learning, but this enhancement is in reality slight and differs between subjects and students' ages. A good example of the 'hyping' and distortion of research relating to ICT and education is Clarke's (2003) claim that the ImpaCT2 showed that ICT improved pupil attainment in all subjects at all levels.

The ICT Test Bed project carried out between 2002 and 2006 was initiated by the DfES who invested £34 million over four years, giving 28 Test Bed schools and three FE colleges in three areas of socio-economic deprivation access to very high levels of ICT hardware and appropriate software (Somekh, 2007). Somekh (2007) concluded that as technology was embedded, schools' national test outcomes improved beyond expectations with the greatest impact being for primary rather than secondary schools. In contrast to the Key Stage 2 data, no significant differences were found at Key Stage 3 between the performance of the Test Bed and comparator schools for any year of the project. Both the Test Bed and comparator schools made significant gains in their Average Point Scores (APS) between 2003 and 2005, but this plateaued in 2006. However, in 2006 significantly more Test Bed pupils achieved five or more A*-C grades (including English and Mathematics). Again there is evidence that digital technology can enhance learning, but again this enhancement is in reality slight and differs between students' ages. The benefits of technology in classrooms can be exaggerated, leading to continuing wasteful investment, and more importantly, significant difficulties for teachers who try to fit their practice to technologists' unrealistic aspirations (Convery, 2009, p.38).

In conclusion digital technology in education is widely researched, cited and reported. There is much feeling that teachers are not making as much use of digital technology as they could (Crook, 2012, p.65; and Selwyn, 2012, p.83) and that students like digital technology and would like their teachers to use it more (DFE, 2011, p.16). There is much debate surrounding the ideas of digital natives and the digital divide. Li (2007, p.392) notes that although students are a critical stakeholder group, their voice is heard only faintly in most school technology initiatives. Pedretti, et al. (1998) highlight a possible explanation for this phenomenon as being that education research provides scant information about student views. Haydn (2003, p.30) states that if the government is to bridge the 'rhetoric-reality' gap, and move towards its vision of an education system transformed by the power of new technology, it will have to listen to what teachers say about ICT, rather than relying principally on its 'delivery' metaphor, and the belief that the 'top-down' transmission of information from 'the centre' can effect change. It was hoped that this investigation with its equal number of student and teacher participants will provide some important insights, particularly in regards to the students' views.

2.3 FRAMEWORKS AND THEORIES

There are many frameworks and theories suggested for the implementation of digital technology in the classroom. This section is designed to outline some of these theories in order to better inform the theoretical perspective of this investigation. Bennett & Oliver (2011, p.179) suggest that research into learning technology has a reputation for being driven by rhetoric about the revolutionary nature of new developments, for paying scant attention to theories that might be used to frame and inform research, and for producing shallow analyses that do little to inform the practice of education. The theoretical stances of digital technology investigations have been found to be lacking. This, and the generally fast pace of change within the technology industry, demonstrates that demand clearly exists for the development of digital learning technology frameworks and theories. Bennett & Oliver (2011, p.181) observe that as pedagogic thinking shifted from a focus on materials and instruction to social competence, collaboration and situated performance, so too did the theories from behaviourism to social constructivism. It follows then that as this happened for education as a whole it should so happen for digital education.

Johri (2011, p.208) suggests socio-material bricolage as an analytical framework that can assist in the research and design of learning technology by providing a pertinent lens to examine emergent socially and materially intertwined learning practices; overcoming digital technology's inherent dualism (between the social implications of technology use and material aspects of technology design) that can privilege the social or technical while neglecting to consider the assemblage of both. Teachers and learners would benefit from developing a more holistic understanding of their interactions with technology and from a heightened awareness of how the social and material are intertwined (Johri, 2011, p.215). Technologies are continually subjected to a series of complex negotiations and interactions with the social, economical, political and cultural context into which they emerge (Coleman, 2011, p.1). Digital technology has moved beyond providing an experience that locks its users into a solitary and constrained “desktop” experience. The increasingly subtle embedding of this new digital technology into our environment is creating novel forms of relationships with the cultural and social environment (Crook, 2005, p.516). Hooper (1998) and Shaw (2005) refer to research as having shown that culture plays a significant role in an individual’s level of engagement with technology and that the social setting plays a significant role in how a community makes use of technology (Pinkett, 2000).

Laurillard (2009, p.399) states that different pedagogies, learning theories and paradigm approaches can exploit and challenge technology by focusing on a different aspect of the learning process, to generate different conventional teaching methods and different uses of digital technology. Socio culturalism and socio constructivism are two theories where there is overlap in their understanding of the social and cultural world. Socio culturalism prioritises the value of peer discussion as an aspect of learning (Laurillard, 2009, p.5). Socio cultural theorists, such as Vygotsky (1978) and Rogoff (1990) believe that an individual learns via participation in socially and culturally organised practises (Pinkett, 2000, p.181). Socio constructivism holds that learning is a socially enacted process while still promoting the principality of the individual (and her/his physical presence – i.e. brain- based) in learning (Siemens, 2014, p.3); socio constructivism celebrates increased student independence and autonomy in the classroom (Bennett & Oliver, 2011, p.3). Constructionists, such as Piaget (1954) and Von Glaserfeld (1994) believe that an individual learns by actively constructing and reconstructing their conceptual model of the world, given a social and cultural context (Pinkett, 2000, p.3).

The principle contrast between conventional and digital learning designs should be that digital technology facilitates a shift from teacher-focused to learner-focused activities. This shift in educational focus can be seen in the

Conversational Framework (Figure 1). Making the best use of digital technology for education means exploiting these learner-focussed features (e.g. collaboration and peer assessment), not simply using the digital to emulate the conventional (Laurillard, 2009, p.10). The Conversational Framework goes beyond providing a description of the components of a collaborative process, to an account of how the different components of the pedagogic design interrelate to motivate the learner to conceptualise, adapt, act, reflect, revise, negotiate, share, produce, rehearse and repeat what it takes to learn (Laurillard, 2009, p.12).

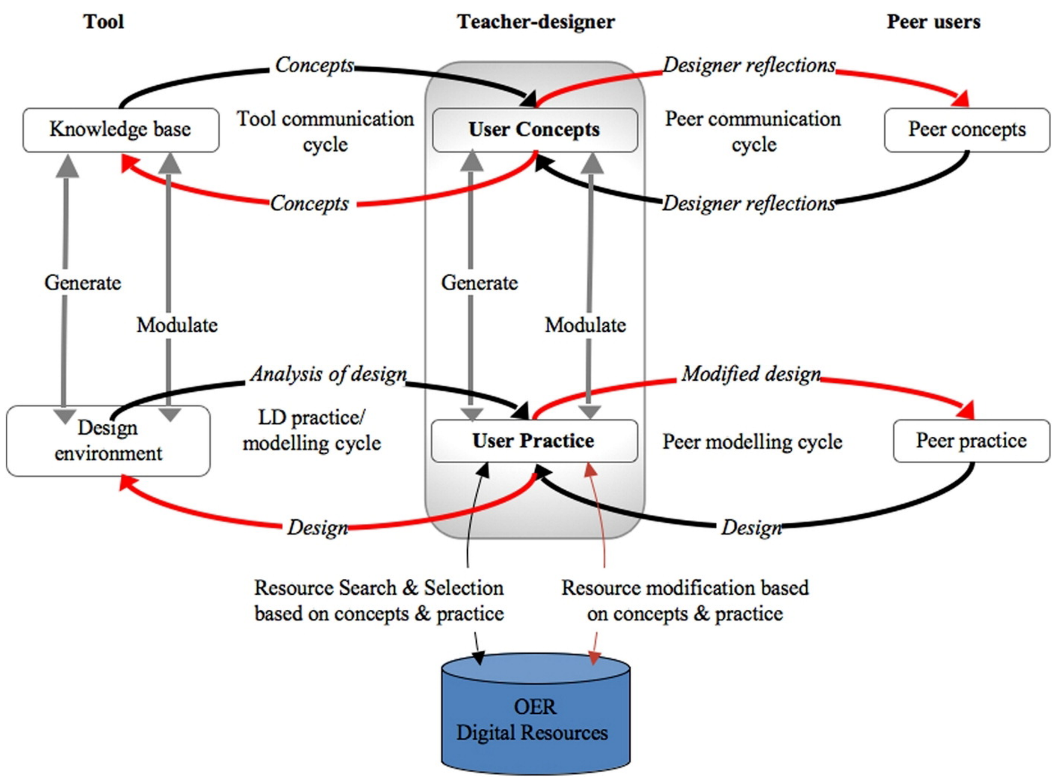

Figure 1: Technology's role as part of Conversational Framework (Charlton et al., 2012, p.235)

One of the more radical socio-material orientations, Actor-network theory (ANT), is being applied to the studies of learning and pedagogy (Fenwick & Landri (2012, p.2). ANT holds that social life is a messy configuration of networks in which actions are contingent upon a shifting set of factors, animate and inanimate, and that activities such as learning are not solely psychological, nor are they entirely social, but are generated through the relational activities of socio-material networks (Bhatt, p.297, 2012). Within ANT Human and non-human actors in a research site are given equal footing (Warren, 2003, p.3). ANT allows researchers to move beyond and question assumptions while examining implicit beliefs. ANT is one tool that helps us to ask questions that seem to stand logic on its head (Warren, 2003 p.12). Between the 1950s and early 1980s, Erving Goffman worked to describe the structure of face-to-face interaction and to account for how that structure was involved in the interactive task of everyday life. He developed a series of concepts (Figure 2), which are useful in describing and understanding interaction, and also showed how the physical nature of interaction settings is involved in people's interactions (Miller, 1995, p.1). Goffman's dramaturgical frame (1956, 1974) discusses life through the metaphor of a performance in which we all play different roles, and in which our behaviour is directed towards creating the kind of impression that we want to give (O'Connor & Scanlon, 2006, p.10).

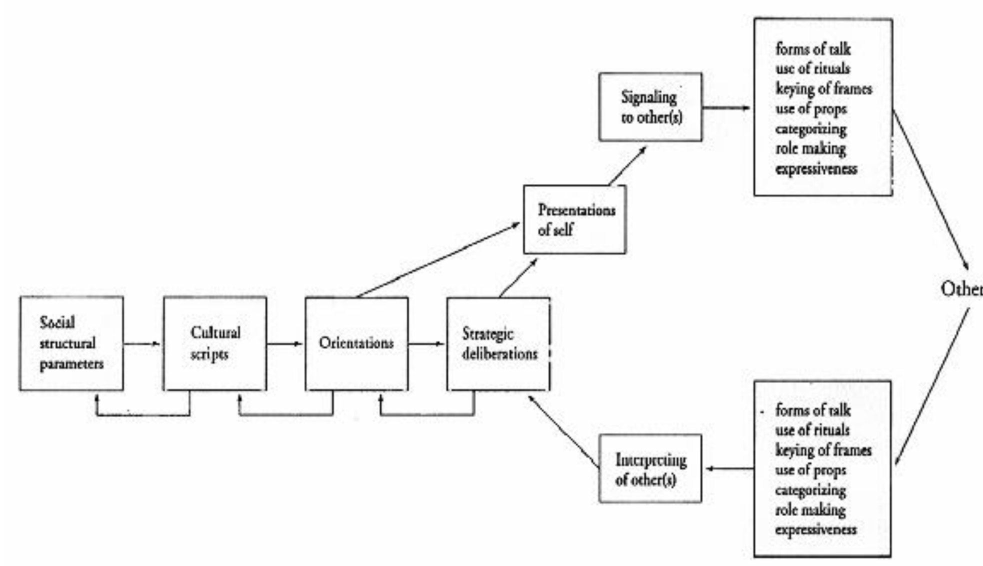

Figure 2: Goffman's Model of Interaction (Turner, 2002, p.24)

Selwyn (2012, p.81) argues that researchers tend to concern themselves primarily with questions of what *should* happen, and what *could* happen once individual learners engage with the digital technologies. This leads to a determinist view of digital technology where the use of which should and will lead to one and only one specific outcome. Although this framework has been criticised by certain academics, some policy makers and industrialists continue to adhere to it (Coleman, 2011, p.3). This has resulted in educational literature, which is predominantly concerned with a relatively uniform view of technology use, led by an enthusiasm for social-constructivism and socio-cultural theories of learning. This view of technology has tended to forego the broader qualities of education and society. Coleman (2011, p.5) advocates the use of social theory if we are to develop rich understandings of the structures, actions, processes and relations that constitute the use of digital technologies in educational settings and contexts.

According to Koehler and Mishra (2009) the development of TPACK by teachers is critical to effective teaching with technology. At the centre of good teaching with technology are three core components, which make up the (TPACK) framework: technology knowledge, pedagogy knowledge and content knowledge. Technology knowledge goes beyond traditional notions of computer literacy and requires an understanding of digital technology broad enough to apply it at work and in everyday life, to recognise when it can assist or impede and adapt continually to its changes (Koehler & Mishra, 2009, p.64). Pedagogical knowledge is teachers' deep knowledge about the processes and practices or methods of teaching and learning (understanding how students learn, general classroom management skills, lesson planning and student assessment) (Koehler & Mishra, 2009, p.63). Content knowledge is teachers' knowledge about the subject matter to be learnt or taught (Koehler & Mishra, 2009, p.63). TPACK is more than just the three components (technology, pedagogy and content) on their own; it is the relationship and interactions between them (see Figure 3). Teaching successfully with technology requires continually creating, maintaining and re-establishing a dynamic equilibrium among all components (Koehler & Mishra, 2009, p.67). The TPACK framework could be thought of as helping to control digital technology to ensure it supports learning whilst ensuring that teachers do not feel overpowered by it.

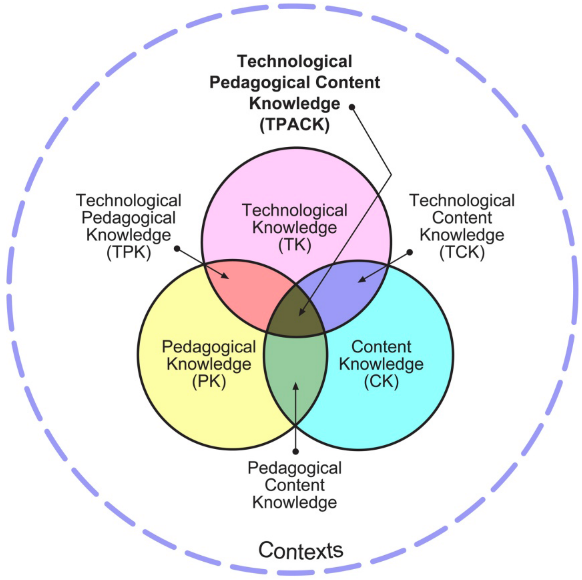

Figure 3: TPACK Framework and its Knowledge Components (Koehler & Mishra, 2009, p.63)

An alternative framework known as the Australian framework (Downes et al., 2002, p.23) provides a clear structure for understanding the interconnectedness of school reform and the role of digital technology in changing what is learned and how it is learned; it provides a more substantial approach to goal setting and programme evaluation. It works by mapping responses to digital technology as either 'Integrative' (using ICT to enhance students' abilities within the existing curriculum), 'transformative' (introducing ICT as an integral component of broader curricular reforms that change not only how learning occurs but what is learnt) or 'reformative (introducing ICT as an integral component of the reform, thus altering the very organisation and structure of schooling). These different types cannot and do not translate to either a pathway to systemic change or a continuum for a focus for teacher development. They represent different ways of thinking about digital technology.

A number of frameworks and theories have been developed in a bid to advise educational establishments in the practice and theory of digital technology. A mix of theories and ideas have been influential; elements of the ANT (chapter 2.3.1) and socio constructivism were important in the design and conduct of this study. The application of an assemblage of theoretical perspectives depending upon the requirements of individual circumstances is encouraged; as there is no one ‘correct’ theoretical stance to adopt when looking at young people, education and digital technology (Selwyn, 2012, p.91). Socio constructivism makes use of a theoretical lens through which there is an attempt to consider the social (social relationships that exist within a school) whereas ANT considers the material (digital technology), so as to provide a universal understanding of technology and its relationship with education. Due to inherently social nature of schools and the many interactions, which occur – between teachers and management, teachers and students, teachers and digital technology, and students and digital technology – the ANT work of Goffman and socio constructivism was thought to have some relevance to this investigation.

Realism was relevant to this study because of the abstract ideas and perceptions which were born of people’s minds but existed independently of any one person (Healy & Chad, 2000, p.120); and to some degree beyond solely the people, to be inclusive of the digital technology and the school itself. In constructivism research a teachers’ and students’ perceptions would be studied for their own sake, however, in realism research, these perceptions are studied because they provide a window into reality beyond those perceptions (Healy & Chad, 2000, p.120). The purpose of this research was to discover, identify, describe and analyse the variables of a complex social situation (perceptions regarding digital technology use in School A), and develop an idiographic knowledge affixed to the experience therefore, a realism methodology was thought to be most appropriate (Outhwaite, 1983).

3 METHODOLOGY

3.1 EPISTEMOLOGICAL BASIS

The realist ontology, the “reality” that researchers investigate (Healy & Chad, 2000, p.119), sees science as the attempt to explain causes and events in the natural or social world, in terms of their underlying and often unobservable structures, mechanisms and processes (Haralambos, et al., 2008, p.850). Realism provides a world view in which an actual social phenomenon can be ascertained even though it is imperfect and probabilistically comprehendible (Guba & Lincoln, 1994; Merriam, 1988; Perry & Coote, 1994; Perry, et al., 1997; and Tsoukas, 1989); within realism there is the belief that there is a “real” world to discover even though it is only imperfectly apprehensible (Godfrey & Hill, 1995; Guba & Lincoln, 1994; Merriam, 1988; Tsoukas, 1989). For the purposes of this investigation the positivist philosophy was rejected because it supposes that the behaviour of human beings can be objectively and scientifically measured in general the same way as the subject matter of natural sciences (McNeill and Chapman, 2005, p. 16); often it is not feasible or ethical to carry out experiments (RCT or otherwise) in social research (Hammersley, 1992, p.196). A positive view can be inappropriate when approaching a social science phenomenon which involves humans and their real-life experiences, as it treats respondents as independent, non-reflective objects which ignores their ability to reflect on problem situations, and act on these in an interdependent way (Robson, 1993, p.60; and Healy & Chad, 2000, p.119).

A paradigm is a set of linked assumptions about the world which is shared by a community (Deshpande, 1983, p.101), realism is one such paradigm. Realism will be employed as part of this investigation as it assumes that the various and complex social systems within School A cannot be reduced to a single formula or explanation, nor can sociologic experiments ever achieve repeatability (Baskerville and Pries-Heje, 1999, p. 3). Therefore, a qualitative method of inquiry will be employed in order to explain the causes of events in School A in terms of their underlying structures (for example internal relationships between students, teachers, digital technology, teaching and learning). Unlike positivist approaches, which try to identify covering laws, it considered the context (the school), when discovering the real, underlying mechanisms that connect the students, teachers and digital technology. My role as researcher was to work with the collected data searching for, and questioning, tacit meanings about values, beliefs and ideologies and adding descriptions of the context and interactions to add richness to that data (Butterfield, 2009, p. 318).

Hammersley (1992) describes five general aspects of research design: problem formulation; data collection; data analysis; reporting the findings; and selecting the cases. Data selection can have three strategies: experiment during which the researcher creates the cases to be studied through the manipulation of the research situation; survey involving the simultaneous selection for study of a large number of naturally-occurring cases and case study which combines some features of these other two strategies involving the investigation of a small number of naturally-occurring (rather than researcher-created) cases. A case study is in accordance with the social constructivist view which assumes the relativism of multiple social realities, recognises the mutual creation of knowledge by the viewer and the viewed, and leans towards an interpretive understanding of subjects' meanings (Guba & Lincoln, 1994) while emphasising the importance of culture and context in understanding what occurs in society and constructing knowledge based on this understanding (Derry, 1999 and McMahon, 1997). In contrast, Perry (1998, p.787) states that it is realism which is the preferred paradigm for case study research.

The crucial issue is not which epistemological or methodological choice is best but rather the outcome of thinking through those theoretical priorities in the context of the study proposed (Silverman, 2010, p.136). Case studies occupy a tenuous ontological ground midway between ideographic and nomothetic extremes (Gerring, 2004, p.352) and can be thought of as bridging a methodological gap in the social sciences because they have developed in the direction of eclecticism and pragmatism (Johansson, 2003, p.7). Rather than believing that one must choose to align with one paradigm or the other, Patton (1990, p.39) advocates a paradigm of choices, which rejects methodological orthodoxy in favour of methodological appropriateness as the primary criterion for judging methodological quality. A case study can therefore align itself easily with the realist and social constructivist theory of knowledge that this study leans towards.

3.2 CASE STUDY METHODOLOGY

The case study methodology, the technique used by the researcher to investigate reality (Healy & Chad, 2000, p.119), has been described in a number of ways. These range from: a detailed account of a particular series of events or actions of actors in a bounded system (Ellen, 1984, p.240); to an empirical inquiry that investigates a contemporary phenomenon within its real-life context where the boundaries between phenomenon and context are not clearly evident (Yin, 1994, p.13); and from a choice of what is to be studied and an interest in the individual case rather than a methodological choice (Stake, 2003, p.134); to being one case selection strategy along with experiment and survey (Hammersley, 1992, p.184). The case study methodology will be used as the research approach for this investigation. In this instance the case, bounded system or real-life context that is of interest will be School A and the actors or contemporary phenomenon will be the students, teachers and digital technology.

Case study research attempts to understand the nature of the research problem, reflecting, forming and revising meanings and structures of the phenomena being studied; thus, the case method is well suited for inductively building a rich, deep understanding of new phenomena (Christie, et a., 2000, p.12). Case study was selected because it is a qualitative method, which provides a detailed holistic and contextual view of the issues while being aligned with the epistemological and ontological views of the study. Yin (2003) notes that case studies: describe, understand and explain; while Feagin, et al. (1991) state that they provide a holistic, in-depth investigation and Stake (2003, p.141) reinforces their basis in a situated holistic view of social phenomena and human dilemma which can be influenced by happenings of many kinds. It was hoped that case study would enable myself as researcher to establish theoretically valid connections between the impact of digital technology in School A and the students and teachers, which were previously ineluctable (Ellen, 1984, p.239).

The principal benefit of the case study approach is the great depth of study (detail, richness, completeness and wholeness) of a single unit and the interpretations, descriptive inferences and thick descriptions it yields (Gerring, p.345 – 348 and Stake, 2003, p.139). It was hoped that this depth of study would elicit a new understanding of digital technology in education or at least identify a new perspective on the existing ideas. Path-breaking research is, by definition, exploratory and case studies are often exploratory in nature; “Light bulb” moments build on a close engagement with the particular facts of a particular case (Gerring, 2004, p.350). Hammersley (1992, p.184) observes that a reduction in the number of cases increases the detail that can be collected, and potentially the reliability of the information. This is an alternative view whereby case study information is reported as being more or at least equally as dependable as survey data. Despite the issue of data reliability which is discussed in detail later in this chapter, a choice has been made in this investigation to know more about less rather than less about more (Gerring, 2004, p.348).

In case studies the research subjects are sometimes described as actors in a way that is resonant of the work of Goffman, whereby life is viewed and explored by way of a performance. Tellis (1997a, p.5) states that case studies are done so as to incorporate the views, voice and perspective of the actors and also the relevant groups of actors and the interaction between them. My intimate knowledge of the interconnections among the actors and events allows me to appreciate the theoretical significance of these interconnections (Ellen, 1984, p.240). A resulting benefit of hearing what the actors have to say is that case studies can give a voice to the powerless and unrepresented (Tellis, 1997a, p.5). The teachers, students and digital technology will be given a voice within this investigation; they will have an opportunity to “own” their own research.

In contrast to the many benefits of case studies are the equal number of criticisms, which include those aimed at qualitative case studies for being 'non-scientific' (Johansson, 2003, p.6) and a movement within sociology to make case studies more scientific (Tellis, 1997a, p.3). Denzin, 2001; Glaser & Strauss, 1967; Herriott & Firestone, 1983; Yin, 1989; Silverman, 2010; Mason, 1996; Ragin, 1992 and other social scientists have justified the study of a particular case only if it obtains generalisations and an understanding of 'grand' issues or explanations pertaining to a population of cases. Despite this criticism and an attempt to counteract it by aligning case studies with the other natural sciences there are still those that believe that because case study is not well suited to the identification of causes, this does not mean it cannot be used for this task (Hammersley, 1992, p.193). One method which tackles the question of generalisability in order to achieve reasonable judgements about causal relationships is the comparative approach or multisite case study research which demonstrates the similarities and differences across an aggregate of known cases (Hammersley, 1992; Robinson & Norris, 2001 and Peräkylä, 2004). At its simplest, this method only involves a literature review of other similar studies and a comparison to them (Silverman, 2010, p.129); when wedded to other studies, which share your theoretical orientation, a single school may provide enough data to develop all the generalisations you want (Silverman, 2010, p.132).

A second strategy for improving generalisability is to select cases for study that cover some of the main dimensions of difference in the population of interest or assess the ways in which the primary case is or is not representative to the larger population (Hammersley, 1992, p.190). A third method could involve the use of quantitative measures to infer from one case to a larger population, this might include using survey research on a random sample of cases to obtain information about the relevant aspects of the population of cases and compare the current case to this (Silverman, 2010, p.128). Empirical generalisation is just as legitimate a goal for case study research as is theoretical inferences, and in some respects it is more straightforward (Hammersley, 1992, p.189).

Hammersley (1992, p.191) asserts that evidence should not be scorned simply because it is not statistical, nor is generalisability to a large, finite population always to be the primary goal of research. Generalisation should not be emphasised in all research (Feagin, et al. 1991 and Simons, 1980).

The need for triangulation arises from the ethical need to confirm the validity of the processes and data in case studies (Yin, 1989; Tellis, 1997b, p.9; Tellis, 1997a, p5.). The major feature of case study methodology is that different methods are combined with the purpose of illuminating a case from different angles (Johansson, 2003, Yin 1994, Yin, et al., 1983): triangulation by combining methodologies provides an important way of ensuring the validity of case study research (Johansson, 2003, p.8). Within a case study any data collection technique can be used to assemble the information to provide as complete an account of the course of events as possible: no one technique takes precedence over any other (Ellen, 1984, p.240). A mixed method involving diaries, interviews and focus groups will be employed as part of this case study.

3.2.1 CASE STUDY DESIGN

There are many different types of case studies: intrinsic, instrumental, collective (Silverman, 2010), critical, unique, revelatory (Haralambos, et al.), telling (Ellen, 1984) and deviant (Hughes & Sharrock, 2007). Each of these case study types has a different focus and motivation for how the case for study has been selected in addition to how any conclusions drawn will be used. The four case selection approaches, which stood out as being most appropriate for this investigation, were the deviant, intrinsic, instrumental and some degree of convenience. If the case is purposefully selected then there is an interest in generalising the findings (Johansson, 2003, p.8); if the case is selected via convenience sampling then it can have no claims to being representative (Haralambos, et al., 2008, p.819). There was an element of convenience case selection due to the availability of School A; being employed by School A made conducting research within this school relatively unproblematic.

A deviant case study involves selecting a case for detailed study because it differs from the general pattern (Merton, 1957); its particular circumstances serve to make previously obscure theoretical relationships suddenly apparent (Ellen, 1984, p.239). School A differs from the general pattern because of its unusually high level of access to working digital technology (as described in chapter 1.2) and it has a policy of encouraging teachers to make use of this within their teaching. Cases are sometimes selected for investigation on the basis of atypicality (Hammersley, 1992, p.191); a deviant case study is an example of a purposefully selected case because it has been selected for being unique or extreme (Stake, 1995 and Patton 1990). Johansson (2003, p.8) states that if the case is purposefully selected then there is an interest in generalising the findings. However, if the case were indeed unique what would the conclusions be generalised to?

An intrinsic case study is undertaken because; the researcher wants a better understanding of this particular case, because, in all its particularity and ordinariness, this case itself it of intrinsic interest (Stake, 2003, p.136). This investigation could also be thought to fall into the intrinsic case study camp because it is this case that 'is of interest … in all its particularity and ordinariness' (Silverman, 2010, p.127). Johansson (2003, p.8) notes than in an intrinsic case study the researcher has no interest in generalising findings because they are focusing on understanding the case; if the findings are generalised it is done by audiences through naturalistic generalisation. Stake (2003, p.141) adds to this idea of naturalistic generalisations by stating that intrinsic researchers generalise to happenings of their case in the future and in other situations, they expect readers to comprehend the reported interpretations but to modify their own (Stake, 2003, p.141). The idea of a purely intrinsic case study is resisted by many qualitative researchers (Silverman, 2010) because of the negative connotations regarding the usefulness and in particular the generalisability of information gained from a single case.

In an instrumental case study, the case is of secondary interest, it plays a supportive role, and facilitates understanding or insight into an issue (Stake, 2003, p.137). In this investigation the issue is digital technology and its effect on teaching and learning, focussing on students' and teacher's perceptions. The case is still looked at in depth, its contexts scrutinised, its ordinary activities detailed, but only because this helps the researcher to pursue the external interest (Stake, 2003, p.137) – digital technology, the main focus being something else (Silverman, 2010, p.127). The case may be seen as typical of other cases or not (Stake, 2003, p.137) and therefore may lead to generalisations or not.

It is unnecessary to specify the exact type of case selection method this investigation will fit into, as it can comprise a mixture of all four. Stake (2003, p.137) encourages this outlook when he suggests there is no line distinguishing intrinsic case study from instrumental; rather he identifies a zone of combined purpose separating them (Stake, 2003, p.137). Case studies do not fit neatly into categories; they are heuristic more than determinative (Stake, 2003, p.138).

3.2.2 SAMPLE

Once a sociologist has chosen a topic for research (Digital technology) and a method to carry out that research (case study), they need to decide upon a sample: that is, the actual individuals to be studied (Haralambos, et al., 2008, p.817). Sampling has two functions it allows you to feel confident about the representativeness of your sample if the population characteristics are known and such representativeness allows you to make broader inferences (Silverman, 2010, p.126). Sampling is a major problem for any kind of research. We can't study every case of whatever we're interested in, nor should we want to (Becker, 2008, p.67). Statistical sampling is one useful way of providing for generalizability to a finite population; but it is neither perfect nor the only way (Hammersley, 1992, p.189). Statistical sampling procedures are usually unavailable in qualitative research because data is often derived from one case and it is unlikely that these cases will have been selected on a random basis (Silverman, 2010, p.127). Statistical sampling is not appropriate for this investigation as it is impossible to select the sample from the entire population, as the entire population of all secondary schools in the UK is not realistically accessible. School A was selected in the first instance because it allowed access, however, despite the small sample size it will result in more intensive analysis. Bryman (1988, p.90) argues that qualitative research follows a theoretical, rather than a statistical logic: the issue should be expressed in terms of the generalisability of cases to theoretical propositions rather than to populations.

Theoretical sampling is concerned with constructing a sample, which is meaningful theoretically, because it builds in certain characteristics or criteria, which help to develop and test the theory and explanation (Mason, 1996, p.93). Whether the school studied is typical is not the critical issue; what is important is whether the experience of the teachers and students are typical of the broad class of phenomena to which the theory refers (Bryman, 1988, p.91). Fifteen students and teachers were selected from school A as part of a purposive or theoretical sample – a sample that was chosen for a particular purpose

(Haralambos, et al., 2008, p.819). Selective or purposive sampling is non-probability sampling where the investigated units focus on particular characteristics of interest to best answer the research question; and are based on the judgement of the researcher rather than being randomly selected from a population with the intention of making generalisations (Lund, 2011). The purpose of this sample was to provide varied and detailed data about students' and teachers' perceptions of the effects of digital technology on teaching and learning. There is an acknowledgement that an element of convenience sampling exists, being a sample that was simply available to the researcher by virtue of its accessibility, it is chosen entirely for practical reasons (Haralambos, et al., 2008, p. 819).

Sampling within a case study is not as restrictive as within other methodologies such as experiment. As new factors emerge the sample can be increased in order to report more about the population, using a wider sample to test any emerging generalisations (Silverman, 2010, p.133). The fifteen teachers were selected from a population within the school of approximately one hundred and fifteen teachers. The primary focus was to ensure each teacher selected taught within a different subject area. For example, one teacher of mathematics, one of art, one of drama and so on. Within this an attempt was made to have an equal spread of males and females, experienced and novice, technical expertise and technical beginner, technical evangelist and technophobe. The fifteen students were selected from a population within the school of approximately six hundred and sixty-eight students; the primary focus was to ensure an equal spread of year groups (7 to 11) and genders. Additionally, their Head of House nominated the students for this study; the Heads of House were asked to select only students who were articulate. It was hoped that choosing articulate students would increase the detail and quality of the data collected. However, the possible danger of selecting only articulate students were that their views on digital technology may not be representative of the entire population of School A.

The purposive sampling method known as maximum/heterogeneous variation sampling was used to generate the teacher and student samples as part of this study. It was used to capture a wide range of perspectives relating to digital technology usage in teaching and learning, which allowed a variation in perspectives (Lund, 2011). The units exhibited a wide range of attributes, behaviours and experiences (range of roles within the school (teachers and students), genders, experience levels (trainee teacher to assistant head teacher), subjects and year groups) to provide greater insights into digital technology use by allowing it to be looked at from all angles and identify common themes evident across the sample (Lund, 2011). The teacher group initially consisted of fifteen teachers selected on the basis of being a mix of genders (males x7 and females x8) from differing experience levels (trainee teacher x1, newly qualified teacher x1, subject teacher x6, subject leader x6 and assistant head teacher x1) and different subjects (Art, English x2, Maths x2, RE, History, Geography, PE, Music, Drama, MFL, Computing, Science and D&T).

Some subjects in the school such as Music, Art and History had only one teacher, however for core subjects which had up to five teachers, the selection was made to give a gender balance and experience level spread. The profiles of the non-elected teachers - Art (male, assistant head), Drama (male, subject leader), Music (female, subject leader), History (male, subject leader) and Geography (female, subject teacher) - were used to inform the selection of the elected. In addition, there was some degree of trust sampling; were possible teachers who I knew well were selected to be part of the sample. It was thought that my close relationship with these individuals would allow them to be more frank and honest in their assessment of the diaries' usability and comprehension. Haydn (2014, p.40) tentatively hypothesised that despite the dangers of 'insider' research (Elliott, 1988), people with whom one had a reasonably close and positive working relationship might be more likely to feel that they could/should be more open and 'honest' in their responses. However, an opposing view could be that this closeness might cause them to in fact be less honest by virtue of feeling under pressure to not let me down. There is the danger that respondents may be inclined towards giving answers that they feel might please the interviewer (Haydn, 2014, p.40).

The diary was piloted with two teachers from within my department and three students from within my year 7 form group, again it was hoped that the close relationship with the participants would elicit more truthful responses. The interview prompts were piloted with one very articulate year 11 student who I had taught for two years; it was hoped he would feel confident in providing constructive criticism in regards to the prompts and interview in general. During the first round of diary collections 4 teachers opted out (English, Maths, Science and D&T). Of the remaining 11 teachers 2 teachers (Maths and Drama) did not complete the second round of diaries. The student group initially consisted of fifteen students, again a mix of genders (males x8 and females x7) were selected from different year groups (year 7 x3, year 8 x3, year 9 x3, year 10 x3 and year 11 x3). Again during the first round of diary collections 4 students opted out (year 7, year 8 x2 and year 11). Of the remaining 11 students 1 student (year 9) did not complete the second round of diaries.

3.2.3 GENERALISATION

Generalisation (an inference of applicability beyond the data or the study) is an important issue (and often seen as a weakness of case study approaches), everyone generalises because it is part of our cognitive apparatus and fundamental to the way we live (Robinson & Norris, 2001, p.303). Quite rightly, the problem of 'representativeness' is a perennial worry of many qualitative or case study researchers (Silverman, 2010, p.128) and must be taken seriously (Silverman, 2010, p.135); there is much debate as to whether a case study can be representative of the greater population and therefore as to whether any of the findings and conclusions can be generalised. Hughes & Sharrock (2007, p.224) state that to describe something as a 'case study' is to suggest that what is being studied is an instance of some more general category, and that by studying the instance one can obtain a richer understanding of the general category. This idea is backed up by Stake (1994, p.238) who notes that a case study can be seen as a useful step towards a larger generalisation but warns against a desire to over-generalise; and Robinson & Norris (2001, p.304) who observe that in social and educational research, the findings from multisite and single site case studies are often intended to be generalised to some wider population.

However, this view is contradicted by Haralambos, et al. (2008, p.820) who note that in general case studies make no claim to be representative; a case study involves the detailed examination of a single example of something and is therefore bound to lack external validity; it is not possible to generalise on the basis of case study research findings. This is a view of case studies supported by Hammersley (1992, p.186) who affirms that the choice of case study involves buying greater detail and likely accuracy of information about particular cases at the cost of being less able to make effective generalisations to a larger population of cases; case study findings may be unrepresentative of a larger population (Hammersley, 1992, p.188). Despite the issue of generalisability, a case study is still able to provide important insights into particular actors and themes within the bounded system of school A. Nonetheless, this case study may still be useful outside of the bounded system within which it is taking place as it may enable the generation of new hypotheses which could in turn then be tested against other data or in later studies (Haralambos, et al., 2008, p.820).

Case study researchers seek both what is common or general and what is particular or unique about the case, but the end result often portrays something of the uncommon (Stouffer, 1941; Gerring, 2004 and Stake, 1994), however the search for particularity competes with the search for generalisability (Stake, 2003, p.140). Therefore, the study of “a single case” might be important precisely because of its uniqueness, or because it is considered potentially representative of other cases (Stake, 1994). In this case an equal weighting will be given to that which is common and that which is general; the detailed findings specific to school A will not be obscured by a desire to generalise to a larger population.

There are many types of generalisation in addition to statistical, including: naturalistic (Stake, 1995), analytical (Johansson, 2003 and Yin, 1984), logical (Mitchell, 1983) and fuzzy (Bassey, 2001). Stake (1995) termed the phenomenon of how case study data resonates with the experience of a broad cross section of its readers as naturalistic generalisation. It is associated with narrative case study and more appropriate for qualitative educational research and the development of classroom practice (Stake & Trumbull, 1982). Adelman et al (1976) make similar claims for example, that case studies are strong in reality, down-to-earth and attention holding, in harmony with the reader’s own experience, and thus provide a natural basis for generalisation. The idea of naturalistic generalisation suggests a realignment of the responsibility to generalise away from the researcher and towards the reader/policy-maker/practitioner (Robinson & Norris, 2001, p.306).

Johansson (2003, p.8) and Yin (1989) argue that generalisation from cases are not statistical, they are analytical, based on reasoning which is one of or a combination of deductive, inductive and abductive. Mitchell (1983) reasons that case study research involves logical but not statistical inferences. Robinson & Norris (2001, p.305) describe Cronbach's association of internal validity with the concept of reproducibility; it is the decision-maker or policy-maker who should generalise on the basis of their purposes and judgements about the similarities and differences between their situation and the situation of the study. Bassey's (2001, p.7) fuzzy generalisation should be accompanied by a 'best estimate of trustworthiness' (BET) which should be based on the researchers' own insights. Regardless of the name given to the type of generalisation that results from case studies there is some consensus that generalisations are possible.

Finally, there is an understanding of generalising not in regards to what has happened in the case study but in what can happen if the reader of the research decides to implement the findings within their own practice. Alasuutari (1995, p.155) terms this idea extrapolation and describes how ethnographic research is not so much generalisation as extrapolation; the results are related to broader entities. Generalisation is a word that should be reserved for surveys only; what can be analysed instead is how the researcher demonstrates that the analysis relates to things beyond the material at hand, extrapolation better captures the typical procedure in qualitative research (Alasuutari, 1995, p.156).

Case studies may be described as unrepresentative. However, experimental data may be described as artificial and the conditions unrepresentative of the natural world, which can interfere with generalisability (Campbell & Russo, 1999). The subjects involved in experiments may alter their performance or behaviour due to the process of being observed whereas case study may be more of an approximation to an examination of real life. The case study provides us with information that is less likely to be affected by reactivity and therefore more likely to be ‘ecologically valid’ (Hammersley, 1992, p.192). Similarly, respondent sensitivity may decrease through repeated testing, making them increasingly unrepresentative of the wider population (Robinson & Norris, 2001, p.305). Thomas (2010, p.25) shares the controversial view that what can be usefully generalised about in social science can only be uninteresting or mundane and concerning everyday generalisation.

3.2.4 PRESENTATION AND SELF IMPRESSION MANAGEMENT IN TEACHING

One interpretation of Goffman's work (ANT), is that in any social interaction 'self' is developed and maintained, as well as presented (Miller, 1995, p.7). The role that self-presentation and impression management play in teaching is an interesting idea, which may be worth considering as part of this investigation. O'Connor & Scanlon (2006, p.2) acknowledge the multiple roles that teachers are required to enact and the effect which the context in which they teach has upon their ability to maintain these roles. They remind us that identity could be thought of as both shifting and ephemeral. Teaching often requires its participants to foster multiple identities, each of which is devised for intended audiences: management, other teachers, individual students or groups of students. DePaulo, et al. (1996, p.979) note that the "self" that is presented to others in everyday social life is characteristically an edited and packaged one. They warn that lying is a commonplace strategy for managing impressions and social interactions (DePaulo, et al., 1996, p.980). The beliefs of a teacher and a given school's objectives may be at odds; O'Connor & Scanlon (2006, p.8) describe how this could result in a teacher being forced to publicly accept some aspect of a situation whilst maintaining a subversive viewpoint. As individuals, the subversive and resistant practices which teachers engage in during their work are a means of asserting and expressing their personal identity within the constraints of the institution and demands of a professional role (O'Connor & Scanlon, 2006, p.18).

The notion of teachers being involved in self-presentation and impression management may have implications in regards to qualitative research, particularly as lies are thought to be one method of teacher's maintaining this perception of self. How can data captured from teachers be considered reliable or trustworthy? The information shared may have been edited to create the impression that the teacher aspires to, or believes that the school requires them to achieve. The method of data collection may have some effect on the perceived reliability of the data; Goffman distinguishes between information 'given', that is intended and managed in some way, and that ‘given off’ which ‘leaks through’ without any intention (Miller, 1995, p.2). If the method of data collection (for example questionnaire, interview, diary, observation) is able to capture some of the latter perhaps facts that are closer to the truth can be extracted. Tennessen (1987, p.297) notes that while we may no longer subscribe to the notion of one single ‘correct’ interpretation or truth – that is, after all, Foucault’s principal lesson – this is not to say that we should cease asking whether some accounts are closer to (or further from) the truth than others.

A community of practice is defined as a group of people who share a concern or passion for something they do and the desire to learn how to do it better as they interact regularly (Wenger, 2006). This term could be applied to the teachers within a school. Involvement in a community of practice comprises being active participants in the practices of social communities and constructing identities in relation to these communities (Wenger, 1998). Participation in communities of practice concerns the whole person acting in the world (Lave & Wenger, 1991, p.49); they learn to speak, act and improvise in ways that make sense in the community (Smith, 2003). Communities of practice may provide an alternative view of teachers’ identities as being adaptable and under negotiation but very well established within the educational setting. A community of practice has an identity as a community, and thus shapes the identities of its constituent members (Wenger, 1998). Although the teachers are shaped by their school environment their identity remains truthful and most importantly their own. This would mean that the data collected from teachers would be no more nor less reliable than that obtained from other professionals in corporate or public-sector settings. The implications of self-presentation, impression management and communities of practice are that they pose difficulties when trying to discover the truth and reality of a situation. It is important to be aware that knowledge gained through research is questionable, verifiable and differentially secure (Stenhouse, cited in Elliott, J. & Norris, 2012).

3.3 ETHICAL CONSIDERATION

Cohen, Manion and Morrison (2009, p.73) explain how research is an inescapably ethical enterprise and should be conducted rigorously, scrupulously and in an ethically defensible manner. In line with the ethical requirements of the University written permission was obtained from each of the students involved and a letter outlining the research was sent home to their parents or carers (Appendix A). The students and parents were told about their right to opt out of the research at any time. The students were informed of the research prior to its taking place and informed of their right to terminate their involvement at any stage during the research process. Informed consent was sought from the teachers in a similar way (Appendix B). The students and teachers were briefed on the results of the research following completion of the investigation. As previously stated the school was referred to by the alias of School A; furthermore, all students and teachers were given aliases. These steps ensured total anonymity for all students and teachers participating in the research and ensured that all data collated was confidential. The data relating to this research was kept on my personal computer which was password protected. The research study was submitted to and approved by the School of Education’s research ethics committee.

Elliott (1991, p.14) poses the question as to whether academics are transforming teacher-based educational enquiry into a form which enables them to manipulate and control teachers’ thinking in order to reproduce the central assumptions which have underpinned a contemplative academic culture detached from the practices of everyday life. Elliott’s concerns were taken into consideration during the research conducted within school A. Care was taken to ensure that the teachers’ perceptions were not manipulated nor controlled. In addition, there was the recognition of the potential for teachers to be used as data collection ‘mules’ and likewise for students to be used as data ‘mines’. Finally, there were concerns with regard to the gathering of students’ perceptions; eliciting critiques from students can sometimes challenge a teacher's understanding [what I do in my classroom is my business] (Elliott, 1991, p. 58). Students may offer data, which could be considered sensitive, particularly if teaching is criticised and individuals are referred to by name. In order to combat the potential for this to happen limits were imposed during the data collection stage (described in detail in chapter 3.4). For example, specific examples of teaching should not be referred to, nor should teachers be identified either by name or by subject. In order to ensure that the students and teachers in School A have ownership of the research the conclusions will be shared with them in the form of an executive summary. It is hoped that regardless of the nature of the findings from this study that they will directly benefit School A and its students and teachers in particular.

3.4 DATA COLLECTION METHODS

It was important during the final decision-making process of selecting the data collection method to consider whether quantitative, qualitative or a combination of the two would be employed. Words carry many meanings; they are nuanced and highly context-sensitive; it would be naive to suppose that I as researcher could separate analysis from interpretation, because words themselves are interpretations and are to be interpreted (Cohen et al., 2007, p. 495). This is also relevant in regards to perceptions in general which always depends on assumptions, even though most of the time I as researcher might not be aware of those assumptions (Hammersley, 1992, p.193).

When compared to quantitative data, qualitative data was thought to be more content rich but more open to interpretation and therefore misunderstandings or misreading. The quality of teaching is only one possible explanation for success or failure on the part of students. Other kinds of evidence needed to be collected before the contribution of teaching to outcomes could be judged in its own right; outcome data is not direct evidence of quality (Elliott, 1995, p. 11). In Stenhouse's work on 'research-based teaching' analysis is based on evidence about the complex transactions between the teacher and their students, and between both and contextual actors (parents, principals, other teachers, etc.). Such evidence included evidence of both the observable behaviour of participants and the meanings they ascribe to their own and others' behaviour in the situation (Stenhouse, 1979). In this investigation thick data (the case's own issues, contexts, and interpretations (Stake, 2003, p.139)) about the students' and teachers' perceptions of the effect of digital technology upon learning was collected.

Elements of ethnography were considered as part of this research in order to examine whether teachers are involved in self-presentation, impression management or whether their community of practice (as a teacher at School A -

see section 2.3.1) had an effect on their identity and therefore any data collected from them. Ethnography derives from traditional anthropology, where time in the field is needed to discern both the depth and complexity of social structures and relations (Jeffrey and Troman, 2004, p.535). Ethnographic study requires ‘direct observation, it requires being immersed in the field situation’ (Spindler, 1982, p.154) with the researcher as a major instrument of research (Atkinson et al., 2001, p.13). It would have been this aspect of ethnography, which proved instrumental in determining whether the data captured from the teachers was reliable or whether it is an edited version of the truth. However, ethnographic accounts are considered provisional and tentative (Walker, 1986) and so any conclusions would not have been considered generalisable. Though time-consuming the rewards of ethnography are great; ‘thick descriptions’ and rich analysis that gets close to the lived experience of participants in social settings (Jeffrey and Troman, 2004). However, due to teacher retention at School A it proved impossible to conduct follow up observations on the teachers. After the initial analysis (2 years after the data collection) eight of the eleven teachers had left the school. Therefore, any data collected during observations would have been skewed and from too small a sample of the original population.

Two data collection methods were employed as part of this investigation: diaries and semi-structured interviews/focus groups. It was hoped that the rich, qualitative data such methods generate could do some justice to the complexity of the students’ learning and teachers’ teaching, complexity which could be missed had only quantitative methods being used (Woods, 2008, p184). However, this being said some quantitative data was collected via Likert scales in the diaries and descriptive statistical analysis were used to examine this data. These methods enabled a thorough investigation of the students’ and teachers’ perspectives.

3.4.1 DIARIES

Corti (1993) describes diaries as a research instrument used to collect detailed information about behaviour, events and other aspects of an individuals' daily life. Diaries can be used to record information that otherwise may be forgotten and can help overcome the problems associated with collecting sensitive information via interview. There are two types of diaries, structured and free text diaries. A combination of the two was used with some closed questions in a structured section (e.g. what type of digital technology was used and how long for) and writing space in a free text section. A rating scale was also employed; it was a useful device for differentiating responses (e.g. how useful is digital technology 1-5) and generating numbers (Cohen, Manion and Morrison, 2007, p. 386). The diary consists of 5 pages, 1 for each day of the school week. It was hoped that the structured section would secure some factual information (details about the digital technology used, comments on its use, duration, perceived usefulness and effect on learning/teaching), which was subjected to quantitative analysis. It was hoped that the free text section would provide the participants with a feeling of ownership, and encourage them to share their own thoughts and feelings about digital technology and learning/teaching without being prompted or led by any researcher's preconceived ideas. However, there was the awareness that too many 'free response' questions might dull the enthusiasm of participants, particularly busy teachers and uninterested students.

The Diaries were designed to collect information about when and how the teachers and students in School A used digital technology for teaching and learning, in addition to their perceptions of its usefulness and effect on their teaching and learning. Perceived usefulness is a key factor for users' willingness to be guided through a digital system's learning process (Domingo and Gargante, 2016). The diary was piloted with two teachers and three year 7 students. Following the pilot (Appendix C) one improvement was made to the final student and teacher diary (Appendix D): a 'Subject' column was added to the student diary to find out for which subject the digital technology was being recorded and a ‘Subject’ space was added to the front of the teacher diary to identify which subject was being taught.

The students (differing ages) and teachers (differing subjects, experience and length of service) were asked to keep a diary for one week on two separate occasions during the school year. The first occasion was during the autumn term (September to December 2014) and the second occasion was during the spring term (January to April 2015). The timing of these occasions was selected to allow for the interviews/focus groups to happen in the summer term (May to July 2015). Data was collected from only eleven students and eleven teachers so the prohibitive labour involved in analysing a large sample of diaries was discounted in this case study (Corti, 1993). The diaries completed in this study may be prone to errors because of incomplete information recording and inadequate recall; additionally, as only articulate students were invited to be involved in the study it could be argued that the results are biased towards the population of competent diary-keepers (Corti, 1993).

3.4.2 INTERVIEW AND FOCUS GROUPS

Interviews are one of the most important sources of case study information (Tellis, 1997a, p.12). Dunne, Pryor and Yates (2005, p. 27) describe an interview as being a very adaptive and powerful method suitable for most research paradigms, disciplinary perspectives and substantive fields. Haralambos, et al. (2004, p. 828) describe interview advantages as being that concepts and words used can be clarified, issues can be explored in great depth and the researcher does not limit the responses to fixed choices. Therefore, interviews can be useful for generating new hypotheses and theories, which the researchers may not otherwise have previously considered. Zimmerman and Wieder (1977) advocate asking diary-keepers to elaborate on their written accounts in a follow-up in-depth interview allowing the diary keeper to actively participate in both recording and reflecting upon their own thoughts and behaviours. The diary was used as a framework to allow the interviewees to explain their written accounts and interviewer to probe their views on digital technology. Kitzinger (1994, p.159) comments on the dynamic, interactive nature of group interviews and how they ‘enable the researcher to examine people’s different perspectives as they operate within a social network, and to explore how accounts are constructed, expressed, censured, opposed and changed through social interaction’. Group interviews were used in five out of the eight instances as it was hoped that observing, capturing and exploring the social interaction of the group would create meanings (Swain, 2006).

The interviews/focus groups followed the two diary keeping sessions. The interviews were undertaken utilising the guide approach where topics and issues were specified in advance but the sequence and wording of the questions were decided during the course of the interview (Cohen, et al., 2007, p.353). This allowed for a systematic approach, which retained a conversationalist feel for the interview. It was intended that the unimposing style of these follow-up interviews and the fact that they were group interviews would encourage the interviewees to be more open and forthright in their responses during the interviews. The disadvantages included inaccurate responses, responses that may not reflect real behaviour and myself as interviewer having directed respondents towards certain types of responses (Haralambos, et al, 2004, p. 828).

The pilot Interview prompts (Appendix E) were designed to collect information about the types, frequency and amount of use of digital technologies used for teaching and learning; in addition to their perceptions of its effectiveness, engagement and ability to drive achievement and progress in School A. The interview prompts were piloted with one year 11 student. Following the pilot several improvements were made to the prompts: the eleven questions were split into six main sections with several sub questions to prompt the interviewees; the interviewees were also asked to use examples to describe their digital technology usage; an Internet question was added; and a pressure question was added. The improved interview prompts can be found at Appendix F.

Data was collected via interview/focus group from the same two groups, teachers and students. The teacher group of 11 was further reduced because two of the teachers (MFL and English) left the school for jobs at new schools. The student group of 11 students was further reduced because one of the year 11 students went on early study leave. The interview/focus groups questions centred on six main topics: top three digital technologies for learning/teaching; is enough digital technology used in your learning/teaching; effectiveness of digital technology for learning/teaching; rating of confidence with digital technology; pressure to use digital technology and the Internet's impact on learning/teaching.

3.4.3 ADMINISTRATION

The diaries were given to the selective sample of eleven teachers and eleven students from School A to complete over one school week during the Autumn and Spring term. The teachers and students were briefed on the details of the study's intentions and given guidance as to how to complete the diary (a sample from the teachers' and students' diaries can be found in Appendix G and Appendix H respectively). A mixture of interviews and focus groups were administered in the Summer term following the diary data collection. Whenever possible the students interview/focus groups were conducted in year groups and the teacher interview/focus groups were conducted in subject areas. The interviewees were provided with both of their diaries and a list of software/hardware available within the school (Appendix I) to act as a memory aid. The interviews, which were conducted in a semi-structured style with the aid of prompts if necessary, were recorded using a smart phone (a sample from the transcriptions can be found in Appendix J).

3.5 DATA ANALYSIS

Data analysis consists of examining, categorising, tabulating, or otherwise recombining the evidence to address the initial propositions of a study (Yin, 1994). The qualitative data was coded and labelled to identify important thematic ideas. Coding enabled the data to be examined together and compared. Open-ended answers of the type found in the diaries and interview transcripts are challenging to code, as it is not always easy to predict in advance the kind of coding categories that could be employed (Hughes & Sharrock, 2007, p.103). Pattern-matching whereby several pieces of information from the same case may be related to some theoretical proposition was another useful technique for linking data to propositions (Campbell, 1975); if the patterns match then the internal reliability of the study is seen to be enhanced (Tellis, 1997b, p.12). Trochim (1989) considered pattern-matching to be one of the most desirable strategies for analysis.

The quantitative data was analysed using descriptive statistics in order to describe and present the data. These types of statistics make no inferences or predictions; they simply report what has been found out in a number of ways (Cohen, et al., 2007, p.504). The Likert variables (usefulness rating) were analysed using frequency distributions (Tellis, 1997b, p.14). Tables were used to present the data rather than graphs because although they are more attractive they provide no more detail than a table of figures (Cohen, et al., 2007, p.507). The rich-thick descriptive data created within the qualitative aspects of this study was used to support the findings from the quantitative coding in addition to providing important and interesting ideas in its own right, regardless of its generalisability. The data collection and analysis was not limited to merely proving or disproving specific hypotheses and can therefore be thought of as minimising researcher bias by removing preconceptions.

Finally, it was important to identify the location of the intended research within the wealth of educational research that already exists and consider its possible usefulness. There is an agreement with Elliott (2001, p.556) that relevant [educational] research informs rather than displaces the judgment of teachers/[practitioners]. However, this being said policy and action should be grounded in the best available empirical knowledge rather than tradition or practitioner preference (Robinson and Norris, 2001, p. 304). It was hoped that the investigation would produce conclusions which via naturalistic generalisations would be useful to the people who will benefit most from their use; teachers and students not only within School A but across the education community as a whole.

The text collected as part of interview and focus group data was analysed as a proxy for experience within School A including Individuals' perceptions, feelings, knowledge, and behaviour as represented in the text, (Tesch, 1990). Guest et, al. (2012, p.3) notes that there are many approaches to qualitative data collection and analysis, representing a diverse range of epistemological, theoretical and disciplinary perspectives. It was decided that an exploratory qualitative data analysis method would be best suited to this study because it asks "what x people think about y"; it has specific not predetermined code categories; it has codes which are derived from the data; it has primary data which is generated; it uses purposive sampling (non probability sampling) (Guest et, al., 2012, p.6); and it generates hypotheses for further study (Guest et, al., 2012, p.6).

The exploratory qualitative data analysis method thematic analysis is a useful, accessible and theoretically-flexible approach to analysing qualitative data (Braun & Clarke, 2006, p.2) providing a rich and detailed, yet complex account of data (Braun & Clarke, 2006, p.5); because although more quantitatively orientated word-based analyses would have involved less interpretation resulting in greater perceived reliability context would not have been considered, limiting the richness of the summary data produced (Guest et, al., 2012, p.6). Guest et, al. (2012, p.10) and Braun & Clarke (2006, p.6) describe thematic analyses as focussing on identifying, analysing, reporting patterns and describing both implicit and explicit ideas within the data, that is, themes. A theme captures something important about the data in relation to the research question, and represents some level of patterned response or meaning within the data set (Braun & Clarke, 2006, p.10). The importance of a theme is not necessarily dependent on quantifiable measures, but rather on whether it captures something important in relation to the overall research question (Braun & Clarke, 2006, p.10; Guest et al, 2012, p.6 and Spencer et, al., 2003). Graneheim & Lundman (2004) define a theme as an expression of the latent content and a category as a descriptive level of content of the text. This data analysis approach benefits from transparent structures with well-defined analytical stages which provide researchers with clear methods for analysing data (Vaismoradi, et, al., 2013, p.403) and although the approach is generally considered the most fundamental, this does not mean that they produce simple and low quality findings (Vaismoradi, et, al., 2013, p.404).

During the literature review, which was conducted prior to the data collection and analysis, ideas relating to the topic of digital technology had been discovered; however, no formal hypotheses had been formulated to either prove or disprove. This investigation can be thought of as exploratory in style as it had no preliminary hypotheses to examine (it would be an overstatement to describe the research approach as ‘grounded theory’, as there was some acquaintance with ideas and theories which related to the field of enquiry; the realist approach recognised the importance of prior theory obtained via a literature review to the research design (Lincoln & Guba, 1985; Miles & Huberman, 1994; Neuman, 1994; Perry & Coote, 1994; and Yin, 1994)) the data against and so was well suited to thematic analysis which stays ‘close’ to the results of the primary study, synthesising them in a transparent way, while facilitating the generation of new concepts and new hypotheses (Thomas & Harden, 2008). It is used in cases where there are no previous studies dealing with the phenomenon, and therefore the coded categories are derived directly from the text data (Hsieh & Shannon, 2005). This method allowed the actual behaviour, attitudes, and real motives of the people being studies to be investigated (Ten Have, 2004). Reliability is of greater concern with thematic analysis than with word-based analyses because more interpretation goes into defining the data items (i.e., codes) as well as applying the codes to chunks of text (Guest et, al., 2012, p.10). However, when compared to grounded theory this interpretation is relatively low (Vaismoradi, et, al., 2013). The process of translation, through the development of descriptive and analytical themes, can be carried out in a rigorous way that facilitates transparency of reporting (Thomas & Harden, 2008).

Braun & Clarke (2006) state that thematic analysis can be conducted within both the realist and constructionist paradigms that this study tends towards. Thematic analysis is essentially independent of theory and epistemological approaches, and is compatible with both essentialist and constructionist paradigms (Braun & Clarke, 2006, p.5). Thematic analysis is not wed to any pre-existing theoretical framework, and so it can be used within different theoretical frameworks, and can be used to do different things within them (Braun & Clarke, 2006, p.9). Thematic analysis can be an essentialist or realist method, which reports experiences, meanings and the reality of participants; or it can be a constructionist method, which examines the ways in which events, realities, meanings, experiences and so on operate within society (Braun & Clarke, 2006, p.9). It can also be a 'contextualist' method, sitting between the two poles of essentialist and constructionism, and characterised by theories such as critical realism (e.g. Sims, et al., 1999), which acknowledges the ways individuals make meaning of their experience, and, in turn, the ways the broader social context impinges on those meanings, while retaining focus on the material and other limits of 'reality' (Braun & Clarke, 2006, p.9). Thematic analysis can be a method, which works both to reflect reality, and to unpick or unravel the surface of 'reality' (Braun & Clarke, 2006, p.9).

The data was collected first before being examined to determine what it would reveal (Chamberlain et, al., 2004). The first step in this exploratory study was to transcribe the interview and focus group data. The second was to become immersed by reading and rereading the data, to obtains a sense of the whole while looking for key words, trends, themes or ideas that would help outline the analysis (Braun & Clarke, 2006, p.16; Guest et, al., 2012, p.8; Polit & Beck, 2003; and Vaismoradi, et, al., 2013, p.401). Next a mixture of: theory-driven codes that were developed from the existing theory in the literature review (A theoretical approach requires engagement with the literature prior to analysis (Braun & Clarke, 2006, p.16)); and data-driven codes that emerged from the raw data were recorded (Braun & Clarke, 2006, p.18; and DeCuir-Gunby et, al., 2011, p.137). Twenty-four theoretical codes were initially identified from the literature review and seven emerged from the data; these can be seen in Table 1.

	Literature Review	**Emerging from Data**
1	Beneficial to teaching	Specialist and subject-specific applications
2	What does digital technology have to offer?	Internet
3	Over enthusiastic technical evangelists, learning theorists and commercial interest	iPads
4	Hype and excitement	Word processors
5	Blame schools	Interactive whiteboards/Projectors
6	Organisational context – school pressure	Personal mobile devices
7	Pedagogy change – instruction to construction – teacher to student centred – interaction and participation – new ways of teaching	Visualisers
8	Logistic or administration – use of digital technology has no pedagogy change	
9	Fear of peer to peer learning and facilitator teacher	
10	Still testing in traditional way	
11	Teachers don't see change	
12	Barriers – workload, integration into curriculum, poor access, limited	

	encouragement, pedagogical beliefs, age, gender, financial, professional development, technical assistance, confidence, lack of time and school and student factors.	
13	Fear of being replaced	
14	Student enjoyment	
15	Enthusiasm	
16	Motivation	
17	Enhancement rather than substitution	
18	Not all students are confident	
19	Negative student views – mistrust of software, still tested on paper, stressful, frustrating, threatening and devious	
20	Non-participants – disenfranchised and conscientious objectors	
21	Low order (motivation) vs. high order (deep learning)	
22	Used for difficult students – minimise disruption	
23	Achievement	
24	Digital native	

Table 1: Initial Thematic Analysis Codes

Then open coding (breaking data apart and allocating codes to blocks of raw data (Corbin & Strauss, 2008, p.195)) allowed ideas and meanings that were contained in the raw data to be explored (DeCuir-Gunby et, al., 2011, p.138). An important question to address in terms of coding was what counts as a theme, or what 'size' does a theme need to be? (Braun & Clarke, 2006, p.10). The raw information was not broken into smaller units line by line or sentence-by-sentence, it was more significant to split text into its levels of meaning; this "splitting" of text occurred at different locations, enabling a code to be made up of a line, sentence, or paragraph, as long as the essence was the same (MacQueen et, al., 2008, p.129).

The data was coded manually by using coloured pens to indicate potential patterns; it was important to ensure that all actual data extracts were coded, and collated together within each code (Braun & Clarke, 2006, p.19). The data (interview transcripts and diaries) was coloured depending on how it fit with the thirty-one codes that emerged from the data and literature review (Table 1): e.g.

data related to teaching benefits was coloured yellow; data related to the Internet was coloured green. After coding the data, it was necessary to sort the codes into potential themes, and collate the relevant coded data extracts within these themes (Braun & Clarke, 2006, p.19). All thirty-one codes were inserted into the columns of a spreadsheet and exemplary quotes from the coded data extracts were positioned under these headings. These exemplary quotes were then used to understand the importance of and relationships between these codes; recognising the way in which these codes interacted allowed them to transform into themes. For example “achievement” was a code identified from the literature review - a thematic map of the early coding stage can be seen in Figure 4; a thematic map is a visual presentation of themes, codes and their relationship (Vaismoradi, et, al., 2013, p.403); which turned into a theme connected to “motivation/engagement” and “enjoyment” (the identified themes where then refined: some themes were discarded, some merged and others separated; a candidate thematic map can be seen in Figure 5); which in turn was considered to be a sub-theme of “beneficial to learning”, which had not been an initial code (the third version of the thematic map can be seen in Figure 6). The final version of the thematic map (version 4) can be found in chapter 5, as it directly informs the finding outlined in the Discussion section.

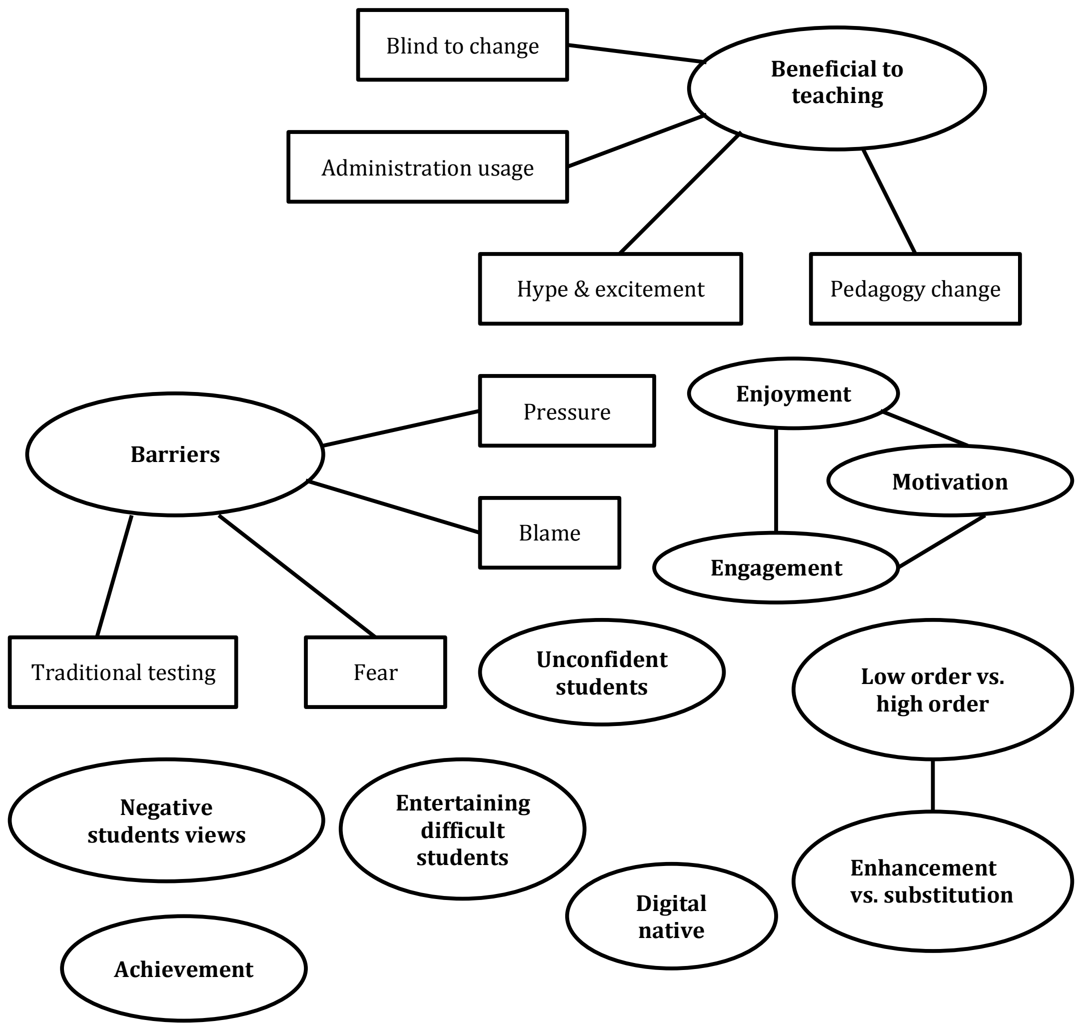

Figure 4: Thematic Analysis Map (Version 1)

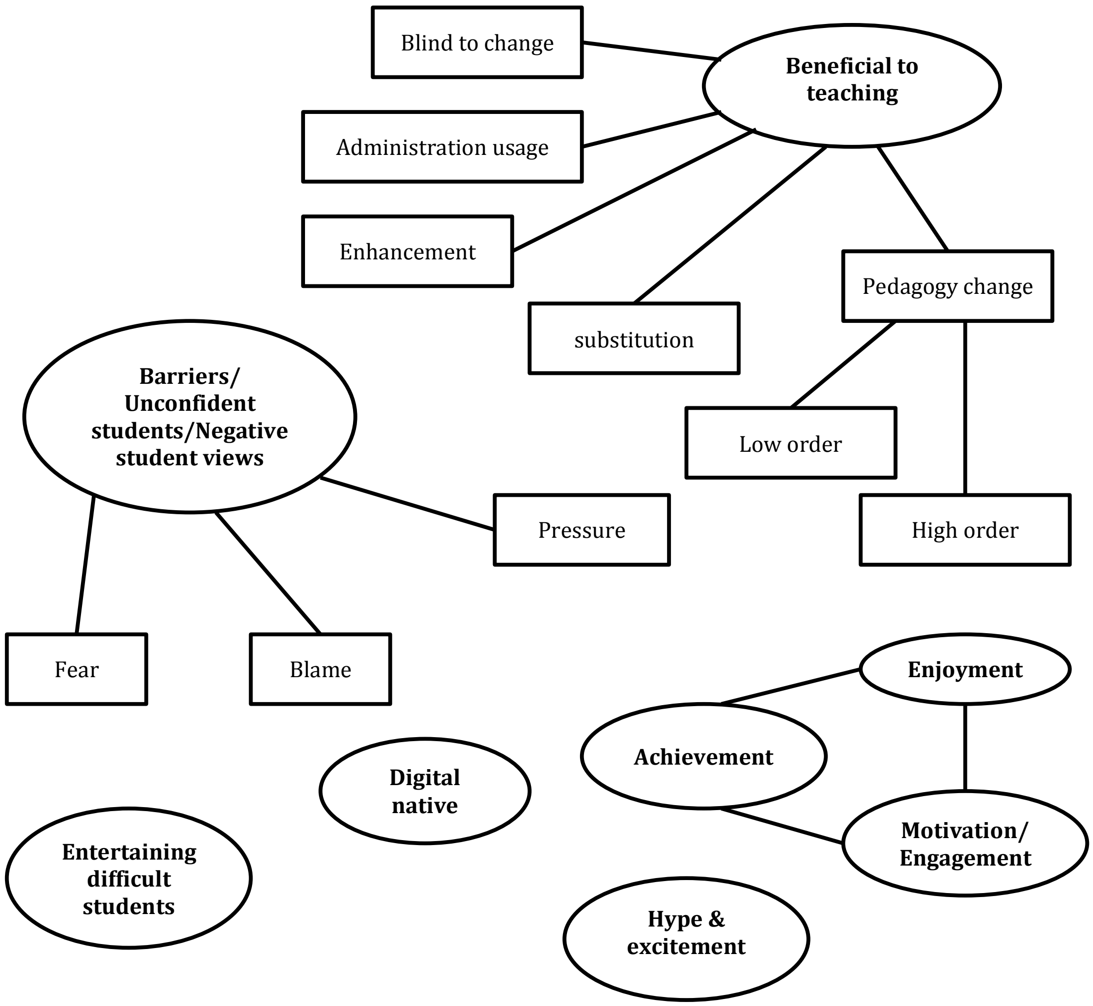

Figure 5: Candidate Thematic Analysis Map (Version 2)

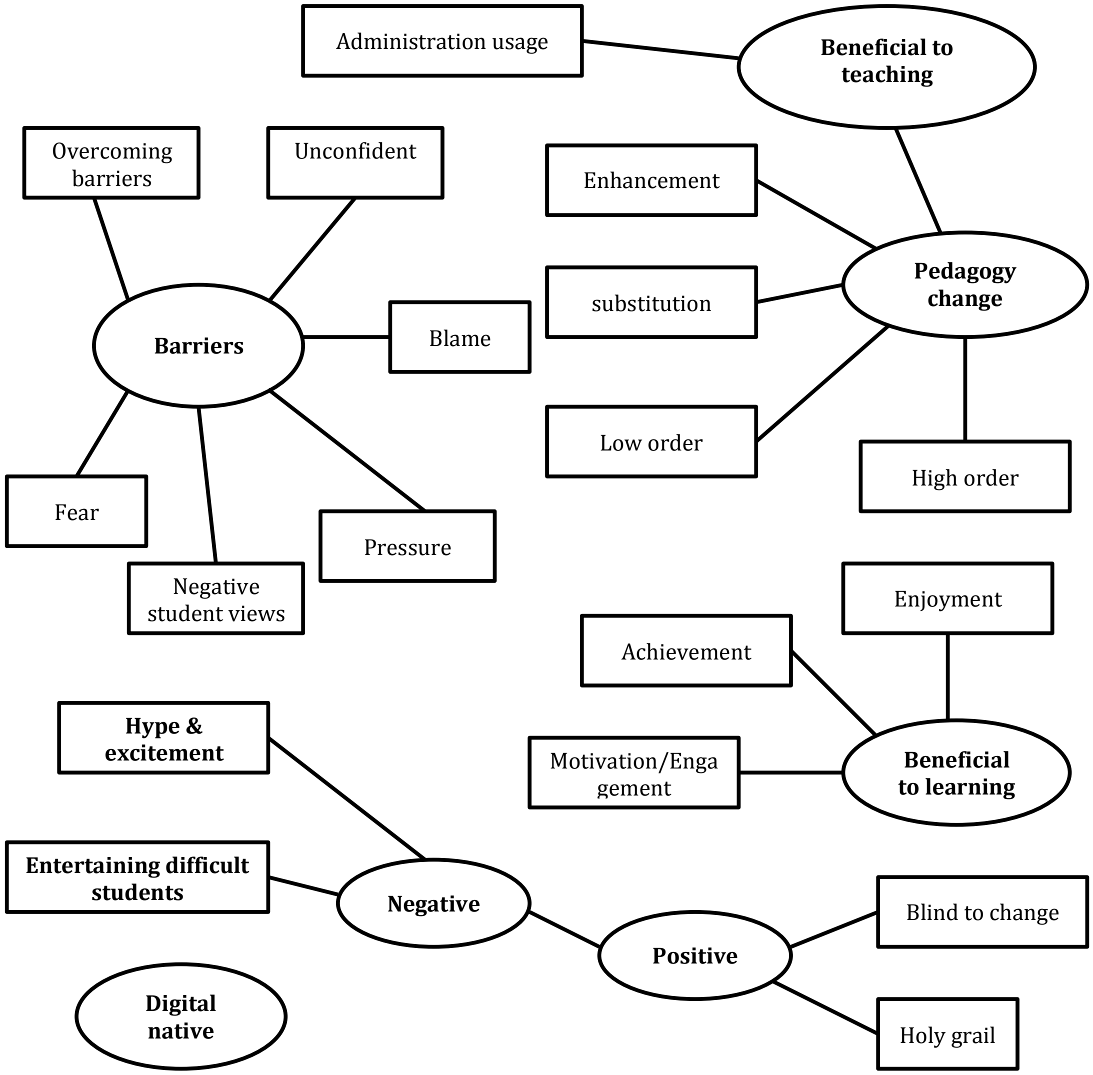

Figure 6: Thematic Analysis Map (Version 3)

The final stage of data analysis was related to reporting the result (story line, map, or model was encouraged) of the previous stages (Vaismoradi, et, al., 2013, p.402). The result should be the identification of a story, which the researcher tells about the data in relation to the research question or questions (Vaismoradi, et, al., 2013, p.403). This is more than presenting a few evocative or emotionally moving stories or quotes: it is presenting numbers, talking about how data are stored (Guest et, al., 2012, p.13) and describing the cases using sufficient descriptive narrative so that readers can vicariously experience the happenings and draw conclusions, which may differ from those of the researchers (Stake, 2003, p.141). The findings enable the reader to develop their practical reasoning, craft knowledge or tacit knowing: the ability to see the right thing to do in the circumstances of their own practice (Thomas, 2010, p.23). One striking advantage of well-presented case studies is the possibility that the information recorded in the account may be reanalysed by others either to deepen the analysis or to present an alternative interpretation (Ellen, 1984, p.241). One of the best ways of judging the quality of findings is whether new insights into the studied phenomenon have been provided; if so, the study should have increased the understanding of particular phenomena (Krippendorff, 2004).

4 FINDINGS

4.1 TEACHERS' REPORTED USE AND PERCEPTIONS

One research aim of this investigation was to investigate how teachers of different subjects are using digital technology in their lessons in one school. This was achieved using diary data collection during two separate weeks of the school year where teachers recorded how they were using digital technology. Open answer prose recorded in the diary (describe how the digital technology affected your teaching and describe any feelings you have about digital technology and your teaching) and interview/focus group data collected in the summer term (April to July 2015) were used to enhanced the understanding of the teachers' use of digital technology. Six possible categories of use arose from the qualitative data findings: interactive whiteboards, visualisers, iPads, personal mobile devices, subject-specific or specialist applications and Internet.

The values in Table 2 and 5 were calculated by categorising the digital technology recorded in the teacher and student diaries. The digital technology and length of time in minutes as recorded was placed into one of the four or seven main categories (projector and whiteboard, computer, laptops and iPads for Table 2; and projector and whiteboard, computers, laptops, iPads, students' choice, electronics kits and scanners for Table 4) and then grouped together with other similar uses of that technology (for example projectors were used with sound clips, video clips and DVD's). The length of time was converted into hours and a percentage was calculated. In addition, a total for each of the four or seven main categories was included and a total percentage. The sessions described in Tables 3, 5, 6 and 7 refer to the different times in the school year during which data was collected. Session 1 refers to diary data collected during the autumn term (September to December 2014) and session 2 refers to data collected during the spring term (January to April 2015). Table 3 shows the number of hours in a week that the teachers in School A spend teaching with the aid of digital technology as a ratio of the total hours spent teaching.

The data from the diaries is detailed in the tables below (Table 2 and 3). Table 2 shows that the four main digital technologies used by the teachers in school A include the projector and whiteboard (52.3%), computers (20.4%), laptops (13.8%) and iPads (13.5%). The projectors were used in nine different ways; the most common of which are in conjunction with PowerPoint (60.7%), iPad/DSLR camera (14.1%) and video clips (12.7%). Seven teachers (Mathematics, RE, History, Geography, PE, English and Art) described how often they used interactive whiteboards in their everyday teaching: “I definitely use it all the time, every lesson”; “every single lesson”; “on a daily basis”; “obviously projectors we all use pretty much on a daily basis for most lessons” and “every lesson for the projector”. They described what they thought of them: “the whiteboard projector’s pretty crucial”; “just easier and more interactive” and “we are quite reliant on those”. They described what they used them for: “display your instructions”; “for a timer”; “dates and titles”; "display map of medieval Norwich”; "thinking skills game using images and dates on the whiteboard".

The computers were used in nine different ways; the most common of which were with the Internet and specialist or subject-specific software (38.0%) and specialist or subject-specific software (28.0%). Three teachers (Maths, Photography and Music) of the eight interviewed identified specialist and subject-specific applications. They were very positive in regards to the subject software that they used for teaching. “MathsWatch and MyMaths and those types of software that we’re using in the department I think it’s, kind of, bridging the gap between teaching and making it accessible in their world.” “Full composition [GarageBand and Sibelius] that’s made things so much better, the quality is immeasurably better.” In addition, they described its frequency of use in their subjects. “Teaching photography we use Photoshop all the time.” “I use Edmodo loads in lower school, which they use really well and I communicate loads of stuff through that and they can upload things.” In the computing teacher’s diary, they highlighted specialist applications and creativity: "using Scratch is great as it teaches a skills (coding) and allows creativity" and "Dreamweaver enabled a level of creativity". The laptops were used in four different ways; the most common of which was with the Internet (53%). Three teachers were very positive about the relative merits of the Internet for student research. “I think we’ve found using computers for research can be an amazing tool.” The teachers describe the Internet as “free”, “immediate”, “up-to-date, doesn’t exist in a book yet” and “a wonderful source of examples”. However, there is still some worry about the Internet’s ability to distract the students. “Time, which can be lost if not managed properly.”

The iPads were used in six different ways; the most common of which were with the camera and playback (49.5%). Six of the teachers (Geography, RE, History, PE, Drama and Maths) described how they used iPads in their teaching: from “quick research tasks”, to “photos of children’s work” and “film…performances to show students how they’ve performed” to looking at “websites”. The positives: “kids can access an awful lot of really up-to-date stuff and find it themselves”; “It’s instant”; “I just think they’re [iPads] quite handy”; and negatives; “I find it very difficult to monitor what the kids are on”; “give a child an iPad and depending on your relationship with them it can go terrible places” and "using iPads outside it difficult this time of year [autumn] because of weather but easier in summer". In the diaries the drama teacher described "Using technology (iPads) as an "enabler" or encouragement for more recalcitrant or reluctant student". However, the main sense was four teachers’ confessions that they did not use iPads to what they perceived as their full potential: "I do not exploit the apps available through the iPads".

	Projector + whiteboard		Computers		Laptops		iPads	
PowerPoint	38.8	60.7%						
DSLR camera/iPad	9.0	14.1%						
DVD	3.5	5.4%						
Still Images	0.4	0.6%						
Video clip	8.1	12.7%						
Sound clip	0.1	0.1%						
Timer	1.1	1.7%						
iPad	0.3	0.5%						
YouTube	2.7	4.2%						
Total (Hours)	**64**	**52.3%**						
Specialist/Subject Specific Software			7.0	28.0%				
PowerPoint			1.7	6.7%				
Email			1.7	6.7%				
Printers			0.2	0.7%				
Scanners			0.3	1.3%				
Internet			0.9	3.7%				
Internet + Specialist/Subject Specific Software			9.5	38.0%				
Internet + PowerPoint			1.9	7.7%				
Internet + Word Processor/Photoshop			1.8	7.3%				
Total (Hours)			**25**	**20.4%**				
Internet					8.9	53.0%		
Word Processing					4.0	23.8%		
Audio recording					3.0	17.8%		
Internet + Specialist/Subject Specific Software					0.9	5.4%		
Total (Hours)					**16.8**	**13.8%**		
Internet							4.5	27.3%
Camera + playback + Internet							3.0	18.2%
Camera + Playback							8.2	49.5%
App							0.3	2.0%
Video clip							0.3	2.0%
Translation software							0.2	1.0%
Total (Hours)							**16.5**	**13.5%**

Table 2: Teachers' Digital Technology Use

In session 1 (Autumn term) the top 3 subjects recording the most use of digital technology were Mathematics (94.4% of the total hours), Computing (54.4%) and Geography (52.4%). In session 1 the bottom 3 subjects recording least use of digital technology were RE (12.6%), Drama (27.5%) and PE (31.3%). The percentage difference between the top and the bottom was 81.8%. In session 2 (Spring term) the top 3 subjects recording the most use of digital technology were Computing (95% of the total hours), Art (59.4%) and Music (55.3%). In session 2 the bottom 3 subjects recording least use of digital technology were RE (15.3%), PE (24.2%) and History (24.3%). The percentage difference between the top and the bottom was 79.7%.

	Session 1 Length of Time (hrs)			**Session 2 Length of Time (hrs)**			**Total Hours**
	Digital Technology Use	**Ratio of Total hours**	**Ranking**	**Digital Technology Use**	**Ratio of Total hours**	**Ranking**	
Humanities 1 (Geography)	10.5	52.4%	3	8	40.0%	5	20
Humanities 2 (History)	6.0	31.7%	8	4.6	24.3%	7	19
Humanities 3 (RE)	2.3	12.6%	11	2.8	15.3%	9	18.5
Arts 1 (PE)	5.2	31.3%	9	4.0	24.2%	8	16.5
Arts 2 (Art)	5.4	33.9%	7	9.5	59.4%	2	16
Arts 3 (Music)	9.3	45.5%	4	11.3	55.3%	3	20.5
Arts 4 (Drama)	5.8	27.5%	10	0	0.0%	0	21
Languages 1 (English)	9.0	45.0%	5	5.7	28.3%	6	20
Languages 2 (MFL)	6.5	41.9%	6	7	45.2%	4	15.5
Mathematics 1	17	94.4%	1	0	0.0%	0	18
Computing 1	8.2	54.4%	2	14.3	95.0%	1	15
	85.2			67.2			200

Table 3: Teachers' Time (hrs) Spent using Digital Technology

The PE teacher was "Thankful for teaching in an era where we have whiteboards rather than overhead projectors." Three teachers described how they feel when their projectors are not working: "If your projector's not working or something that's a bit of a disaster"; "I've had times where if the lamp's broken it's a bit of a struggle to, sort of, adapt. I'm like oh my god I'm going to have to think on my feet a bit more" and "the day you come in and your projector's not working it's suddenly like a mad panic of what you're going to do?"

The maths teacher reported regularly using the interactive feature of the whiteboard in her room. "I use [the interactive whiteboard] every single lesson that I have taught for the last goodness knows how many years at the school, interactively." This teacher described her use of ActivInspire (interactive whiteboard software) software: "allows me…like the reveal stuff and everything and it's a lot easier to write equations because they've got a really nice bit of maths software that I can write equations for as well". The history teacher wrote about their use of interactive features: "In history we use PowerPoints interactively with the students - starter activities and quizzes" and "students used whiteboard interactively to label the map". However later noted "I tend to use PowerPoints in a more creative way than using the interactive whiteboard" and "it is hard to use interactive whiteboards effectively I feel". The drama teacher wrote about using the interactive whiteboard to engage students. "Helped to get some less settled students engaged as they wanted to come and use the whiteboard."

Three teachers (RE, Geography and History) described their reasons for not using the interactive whiteboard: "my room is behind the double doors, so every time the kids walk through the doors it goes bong and the walls shakes and it knocks it out of alignment"; "I find it hard to use the interactive whiteboard, you know, I find it hard to use it and engage the kids apart from just writing it and getting the kids to come up and highlight something or pointing things out." "I just find usually they're so unreliable with actually being aligned and the pens working". The English teacher wrote about her worries over the interactivity of whiteboards "I feel they [interactive whiteboards] often prove nothing more useful than a display board."

Two teachers (Art and Mathematics) described how they regularly used visualizers in their teaching: “every single lesson” and “we use it all the time “. Both teachers identified the same positives of “demonstration” (The benefit of multimodality of modelling [using a visualiser] was seeing as well as hearing (Mavers, 2009, p.17)) and “presenting students work” to “celebrate or scrutinise” (Sharing completed work included opportunities for improvement, comparison, teachers’ advice and helping others (Mavers, 2009, p.24)). The maths teacher described a more practical classroom management consequence of using the visualiser: “I think by the sheer fact on a very simplistic level when you are using the visualiser and the [interactive] whiteboard you are looking out at your children and your body language allows you to watch everything more closely than if you were at a board.” This teacher’s understanding supports Mavers (2009, p.24) view, who described the visualiser as a digital display severed from the teacher’s body and magnified on the screen, and integrated into whole-class face-to-face exchange. However, two teachers described why they did not use the visualiser despite them being present in their classrooms: “I mean, the visualiser thing I don’t do that. I don’t usually use things unless I myself feel entirely competent about them” and “I never plug mine in”.

Two teachers (Drama and History) recognised the pervasiveness of mobile devices to students in the modern classroom: “…because of their [mobile phones] prevalence within the classroom”; “technology is so embedded in their culture with selfies and phones and everything”. These two teachers then continued to describe the negative effects of those devices: “they serve precious little point in being in my room” and “It’s a bit of a bugbear for me in this school because students do abuse when they have their phones out”. However, the history teacher did appreciate that these devices could be used in a more positive way, “I would love to try and use mobile phones more in lessons and try to use it a bit more creatively”. The Music teacher believed that the correct use of mobile devices needed to be taught to the students “you go into meetings that we’re in; I’ll be on my phone checking my emails or doing whatever or checking

Twitter or whatever, so we have to teach them that this is going to be all around you forever. You need to just know when to go right I need to concentrate on this, right I can go on this”.

The Internet is described in two main ways: teachers researching for lesson planning and students researching during lessons. Two teacher were very positive about the relative merits of the Internet for their planning: “it’s so quick and easy to look things up, not only for my teaching in the classroom, but also for supporting my department with new legislation and protocols that are coming out”; and “research, planning, it makes a huge difference”. While discussing the Internet five teachers (RE, PE, History, Drama and Geography) considered the usefulness of YouTube to their teaching. They described YouTube as “invaluable”, “great resource”, with a “range of stuff” which can “save a fortune” in licensing fees. YouTube is used by the teachers for different reasons; “homework, in lessons and researching”, it is used for showing good practice “this is what we’re aiming at”, to “grab their [students’] attention” or “get the hook into your lesson for your starters” and to “explain something really difficult…that they need a visual for”. The only negative experience of YouTube was related to setting a YouTube task for homework. “I’ve tried to set homeworks before based on, you know, watch this YouTube clip, have a go with this and just haven’t got a particularly positive response and have ended up having to do, you know, a homework at the end of the day with kids sat in my room watching the video on the whiteboard anyway, so it’s sort of a bit…you need…you know, kids need to be…I think to use it in that way which I think could be really powerful it’s quite…you have to rely on them actually doing it sensibly as well at home.”

The PE teacher explained how Twitter being banned was a real negative for him personally and his department: “Twitter is great for getting messages out and publishing all the fixtures we do, results.” There may be an indication that digital technology has subject specific advantages; subject areas have their own conventions and expectations for learning that will influence teachers’ technology use and technology-supported student tasks (Howard, et al., 2015, p.24). The Geography teacher described how she was reluctant to use blogs due to concerns about the reliability of the information: “I tend to send them [students], sort of, BBC Bitesize or something factual rather than sending them to a blog.” The English teacher described the positives of using word processors for drafting and redrafting coursework: “had they been writing their coursework and going back and editing it by hand we wouldn’t have got anywhere near the level of accuracy that they got”. The subject area perspective is discussed more fully in Section 5.9.

In conclusion the most used digital technology is the interactive whiteboard (52%) although it is mainly used as an expensive projector and display board with the interactive features being used only by Maths and History. iPads are a contentious issue with many teachers questioning their actual merit within their classrooms and perceiving that they are not using them to their full potential: "I do not exploit the apps available”; "I do not feel overly confident with effectively using technology such as iPads"; "I'd like to find out more creative ways of using the iPads" and “in my room I have a trolley of 30 iPads. I only use them for students when carrying out research". Perhaps this is a staff training/development issue or it could be that tablets for educational purpose are overrated. Convery (2009, p.26) notes that although PDAs [tablets] were highly appreciated for administrative tasks their value in school based teaching and learning situations was not proven; the potential of PDAs to help either teachers in their teaching or pupils with their learning is less clear (Perry, 2003, p.3).

Internet usage was described on the whole in a positive light Personal mobile devices were considered a distraction in the classroom, which can negatively affect learning. However, the Music teacher advocated teaching mobile device etiquette “How can I manage myself?” Personal mobile device usage in schools can be thought of as a social issue like that described by Clark, et al., (2009, p.66) who identified the blurring of the boundaries between formal [inside school] and informal [outside school] spaces; and learners' active and routine circumvention of school-designated rules in order to use technologies in the school setting. There is a sense of 'digital dissonance' around technologies as learners and their teachers struggle to negotiate an acceptable balance between the social and educational potentials they offer (Clark, et al., 2009, p.66).

Specialist and subject-specific application use depends on whether the subject (Maths, Photography, Music and Computing) lends itself to software use and if any useful software in fact exists. Studies indicate that teachers' beliefs and their use of technologies in class are dependent on the subject and school cultures that teachers belong to (Ertmer, 2005; Hammond et al., 2011; Karaseva, et al., 2013). Visualisers are used either because they are useful for particular subjects (Art) or a particular teaching styles (teaching from the front of the class). The teachers subject and pedagogical beliefs and practices/habits appear to be important, particularly in regards to software and visualiser use.

4.2 STUDENTS' EXPERIENCE AND PERCEPTIONS

Diary data collection was again used to meet the research aim of determining how exactly students were experiencing digital technology in their lessons. Interview/focus group data and the free text section of the diary was used to support how students experienced digital technology. Six categories emerged from the data (the same categories were obvious in the teacher data): specialist or subject-specific applications; Internet; iPads; word processors; interactive whiteboards/projectors; personal mobile devices and visualisers.

The data from the diaries is detailed in the tables below (Table 4 and 5). Table 4 shows that the seven digital technologies experienced by the students in school A included the projector and whiteboard (62.0%), laptops (22.4%), computers (10.8%), iPads (3%), a choice of digital technology including their own personal devices (1.7%), electronics kit (0.3%) and scanners (0.3%). The projectors and whiteboards were used in six different ways; the most common of which is on their own (75.1%), in conjunction with PowerPoint (16.9%) and video clips (5%). Eight students (two year 7, one year 9, four year 10 and one year 11) described how often they experienced interactive whiteboards, projectors and PowerPoints in their everyday lessons: “Frequently”; “Every English lesson we use the interactive whiteboard, every maths lesson we use it”; “most lessons…unless it’s individual work”; “we use them in almost every lesson”; “It is used in pretty much every lesson”; and “that’s used generally every lesson nine times out of ten”. The students described what the whiteboards were used for: “you can show the whole class what to do instead of just one pupil at once”; “it helps us understand what we’re doing”; “he like has a PowerPoint, YouTube clips and stuff”; "Whiteboards show excellent diagrams that teachers are unable to write on a whiteboard with pens." and “they’re used for PowerPoints to show us what we’re doing in the lesson”.

The computers were used in six different ways; the most common of which were with the Internet (33.5%), Internet and specialist or subject-specific software (28.3%) and specialist or subject-specific software (22.5%). Five students (year 7, year 9, year 11 and two year 10) of the eight interviewed identified subject-specific applications: “I could use something like MyMaths in a maths lesson or something like SumDog”; “MyMaths”; “we’ve used an iPad to take a quiz on Accelerated Reading”; “we use the app Scratch in our computing lesson to make a project”; “In photography obviously you’ve got Photoshop and need that to edit your photos”; “Doddle”; and “you can take Accelerated Reader quizzes in younger years”. Only one student (year 11) was positive about a specific application: “my first use of Photoshop maybe…in my media lesson because it opens me up to a whole world of different possibilities in terms of editing and photos and all sorts, of technology like that”.

The laptops were used in nine different ways; the most common of which was with the Internet (55.2%). Seven students (two year 7, two year 9, two year 10 and one year 11) described the reasons for using the Internet in their learning: “Search stuff on Google”; “we search the news and stuff like that, find out about what’s going on in the world at the minute so we can keep ourselves up-to-date”; “If you need to find out something you don’t know then you just research it online”; “just for like research”; “for example in history when we’re doing independent research and things” and “mainly research”.

The iPads were used in one way, in conjunction with the Internet (100%). Seven of the students (two year 7, one year 9, three year 10 and one year 11) described how iPads were used in their lessons: “if we need to research about what we’re learning and stuff”; “to research things”. Four students (year 9, and two year 10 students) described the infrequent use of the iPads: “we hardly ever use them really, but when we do use them that’s like helpful”; “they’re there and no one touches them”; and “don’t use them at all”. This sentiment was echoed in a student’s diary. "We use iPads/laptops etc. very rarely so we could use them more often."

	Projector + whiteboard		Computers		Laptops		iPads		Choice		Electronics kit		Scanner	
Projector + whiteboard	137.8	75.1%												
Interactive	4.3	2.3%												
PowerPoint	31.0	16.9%												
Video Clips	9.2	5.0%												
DVD	1.0	0.5%												
Speakers	0.3	0.2%												
Total (Hours)	**183.5**	**62.0%**												
Computers			3.0	9.4%										
Internet			10.7	33.5%										
Specialist/ Subject Specific Software			7.2	22.5%										
Internet + Specialist/ Subject Specific Software			9.0	28.3%										
Word processor			1.0	3.1%										
Speakers + Microphones			1.0	3.1%										
Total (Hours)			**31.8**	**10.8%**										
Laptops					7.0	10.6%								
Internet					36.5	55.2%								
Specialist/ Subject Specific Software					3.5	5.3%								
Internet + Specialist/ Subject Specific Software					3.0	4.5%								
Word processing					6.0	9.1%								
Photoshop					4.0	6.0%								
Printer					4.3	6.5%								
PowerPoint					0.8	1.3%								
Teacher Use					1.0	1.5%								
Total (Hours)					**66.2**	**22.4%**								
Internet							7.7	100%						
Total (Hours)							**7.7**	**3%**						
iPads/Laptops									0.5	10%				
iPads/Laptops/ Own devices									1.5	30%				

Laptops/Own devices									1	20%				
Own devices + music									1	20%				
Own devices + Internet									1	20%				
Total (Hours)									**5**	**1.7%**				
Electronics kit											1	100%		
Total (Hours)											**1**	**0.3%**		
Scanner													0.8	100%
Total (Hours)													**0.8**	**0.3%**

Table 4: Students' Digital Technology Experience

Table 5 shows the number of hours in a week that the students in School A spend learning with the aid of digital technology in their lessons (this does not include individual study time). In session 1 the top 3 year groups experiencing the most use of digital technology were year 9 student 1 (17.2% of the total hours), year 9 student 3 (17.2%) and year 9 student 2 (12%). In session 1 the bottom 3 year groups experiencing the least use of digital technology were year 10 student 3 (3.2%), year 10 student 1 (3.8%) and year 11 student 1 (5.2%). In session 2 the top 3 year groups experiencing the most use of digital technology were year 11 student 1 (16.7% of the total hours), year 8 student 1 (13.9%) and year 9 student 1 (13.5%). In session 2 the bottom 3 year groups experiencing the least use of digital technology were year 10 student 3 (3.1%), year 10 student 1 (5.1%) and year 10 student 2 (6.9%). There are differences between students from the same year group, for example in session 1 year 10 student 1 described using digital technology for 5.7 hours, year 10 student 2 for 12.8 hours and year 10 student 3 for 4.8 hours. These differences can be explained in years 10 and 11 as the different students study different subjects, for example year 10 student 2 may study Computing and so would have more exposure to digital technology in their learning. The differences in years 7, 8 and 9 could be explained because they have different teachers who may be using different amounts of digital technology in their teaching.

	Session 1 Length of Time (hrs)		Session 2 Length of Time (hrs)	
Year 11 Student 1	7.8	5.2%	24.2	16.7%
Year 11 Student 2	8.6	5.7%	13.0	9.0%
Year 10 Student 1	5.7	3.8%	7.3	5.1%
Year 10 Student 2	12.8	8.5%	10.0	6.9%
Year 10 Student 3	4.8	3.2%	4.5	3.1%
Year 9 Student 1	26.0	17.2%	19.5	13.5%
Year 9 Student 2	18.1	12.0%	14.3	9.9%
Year 9 Student 3	26.0	17.2%	0	0.0%
Year 8 Student 1	18.0	11.9%	20.0	13.9%
Year 7 Student 1	8	5.3%	15.5	10.7%
Year 7 Student 2	15.0	9.9%	16.0	11.1%
	150.9		**144.3**	

Table 5: Students Time (hrs) Spent using Digital Technology

Three students described what they thought of interactive whiteboards: “I don’t like projectors because sometimes they just give me a headache, if we use them too much”; “I don’t like it, kind of, when people make you constantly watch technology, which you are most the time”; "I think we need to use different technology not just the smart boards” and “I guess you could say that an interactive whiteboard’s a lot better because it’s like movement on a screen, so it catches your attention more than a teacher just droning on for an hour about particles or something”. In their diary one student questioned the usefulness of the interactive whiteboards due to the continued existence of the old style whiteboards in the classrooms: "I don't think the smart board is any use unless with videos or other media because the old school whiteboards are still around". Two students (year 7) described the projectors not working in their lesson: “permanently in English we have problems with the whiteboard”; and “the sound just stopped working and we couldn’t fix it and it wasted about 20 minutes of our lesson”.

When talking about how he would like more digital technology to be used in his lessons one year 7 student gave this example. “When we have the chance to use the interactive whiteboard instead we use a normal whiteboard.” Two students (year 10) identified subjects during which their teachers used the interactive features of the whiteboards: “they do in like maths and stuff” and “in History we use it – the History teacher, like, circles things”. One student identified technical issues as being the barrier for its use: “It doesn’t really work”. Only one student (year 9) mentioned which of their subject teachers used visualisers: “Well we use them, but just mostly in maths and science”. He also described their purpose: “in maths if, like, we can’t understand it on the interactive whiteboard, we can see it when it’s written down on paper”.

Two students described the positives of iPads: “we could use them anywhere round the school”; and “I think they’re good because they’re portable”. Four students described the negatives: “sometimes people fiddle with the iPad and like change the wallpaper or things like that and it gets annoying”; “I’m just not very good at using them”; “they’re less flexible because we can’t print out and we haven’t got as much things on there”; and “people take ‘selfies’ on the iPads instead of actually doing their work”. One student (year 7) identified phones as the worst digital technology because “I don’t have one with apps and stuff” and “sometimes I think there’s more peer pressure about what, kind of, phones you have and - I’ve got a Nokia ‘brick’”. One student (year 11) described how they used their phone for education outside of school: “flash cards that you can view on your phone”.

Two students (year 7 and year 9) described the advantages of the Internet to learning: “easier research”; “you can find out your research so much quicker”; and “if you need to research something that will be easier for you”. However, four students (year 7, year 9 and two year 10) described the disadvantages: “we have to do really long boring lessons of just nothing but research”; “it also can give you the wrong answer as well, like, some websites aren't right so you don't know what websites to trust"; "they don't actually tell us, like, what exactly to research"; and "in science sometimes they just give it to us to research, but we have plenty enough books to do that". One year 11 student referenced the teacher's use of the Internet for lesson planning. "The teacher has more scope for research. It's a lot easier to research because you can just sit on the laptop rather than have to go round libraries and get books all the time."

Two students (year 7 and year 11) described what they used word processors for in their lessons: "We write stories on it"; "we sometimes write book reviews"; and "just to create worksheets". Three students (two year 7 and one year 11) identified the positives of this type of software: "it's really useful, I always get this feeling when I write too much and my hand starts aching"; "you've got things like autocorrect"; "it would be so much easier and so much quicker to just type it up on Microsoft and you get more done" and "you can type which is not so straining on the hands when you're writing."

In conclusion the most used digital technology was again the interactive whiteboard (62%); again the subjects of Maths and History were identified as exploiting the interactive features of the whiteboards. iPads were again a contentious issue with many students noting how infrequently they were used aside from for research tasks. When questioned about their potential uses one student suggested: "Making a presentation in groups or whatever and then recordings." Recording and digital playback is how the teachers had described their use of iPads (49.5%), which is in contrast to the students who did not report any use of iPads for camera and playback in their diaries. During the interviews one student did mention iPads use for "recording things in English if we do something a bit to do with Drama". The greatest difference between the teachers' and students' results was how often the iPads were being used; there was 10.5% variance. The differences do not necessarily signify unreliable data though because there was not a direct link between the students and the teachers in the study; one was not necessarily being taught by the other. It may however, go some way towards explaining how iPads are perceived in School A and why exactly this is. Personal mobile devices were associated in equal measure with peer pressure and outside of school learning.

One student mentioned Visualisers being used only in their Maths and Science lessons; this is similar to the usage described by their teachers (Art and Maths). Again subject-specific applications were described as being used in particular subjects (Maths, English, Photography and Computing), though only once in a positive light (Media). There were some differences in regards to the types of software used by teachers of different subjects. For example, the humanities teachers tended to describe their use of the Internet, YouTube and general software such as word processors. Whereas the arts teachers described their use of the Internet and specialist software (Photoshop, GarageBand and Edmodo). The maths teacher described their use of the Internet and subject-specific software (MyMaths and MathsWatch). This clearly illustrates that the teachers are using digital technology in a more bespoke way, targeted towards enabling them to teach their own subject better. Finally, the disparity in the use of the computers and laptops could be due to the subjects they are used for. The subjects (Computing and Music) who use a lot of subject-specific software have their own desktop computer labs and the subjects (RE, Geography and History) which use the computers mainly for Internet usage or word processing have their own laptops. Internet use was again described in a mainly positive light, though some negatives were mentioned: open-endedness of research, the reliability of information from the Internet and the existence of books for research task were discussed. Finally, the students considered the convenience of using word processing as opposed to handwriting; perceived usefulness is a major determinant of people's intentions to use computers (Davis, et al., 1989, p.997).

The students described use of laptops (22.4%), computers (10.8%), iPads (3%) and personal devices (1.7%) within their lessons but mainly for Internet research (laptops 55.2%, computers 33.5% and iPads 100%), Internet and specialist or subject-specific software (laptop 5.3% and computers 28.3%) and specialist or subject-specific software (laptops 4.5% and computers 22.5%). The teachers described very different usage of laptops (13.8%), computers (20.4%) and iPads (13.5%) within lessons for Internet research (laptops 53% and iPads 27.3%), Internet and subject-specific or specialised software (laptop 5.4% and computer 28%), camera and playback (iPad 49.5%) and camera, playback and Internet (iPad 18.2%). Teachers recorded using the laptops (13.8%), only marginally more frequently than iPads (13.5%). Perhaps it is because the use of laptops is more ingrained in school A and therefore their use is not scrutinised quite as much. The students described a variance of 19.4% between the use of laptops (22.4%) and iPads (3%). This could explain the students' feelings that the iPads were redundant: "I think they're quite pointless, because we don't use them. We have the laptops". The teachers instead discussed their use of computers and laptops in conjunction with the Internet and software, YouTube, Twitter or blogs.

The students' experiences of digital technology were 9.7% percentage points higher for projector use and 10.5% percentage points lower for iPad use than the teachers'. In addition, the students recorded usage of computers (higher by 9.6%) and laptops (lower by 8.6%) was almost the exact opposite of that of the teachers. Although it is important not to overstate this difference with such a small sample size, the differences may be noteworthy and bear out some previous research; pupil/former pupil responses suggesting less use of computers than surveys asking head teachers and heads of department (Haydn, 2004). These figures may suggest that either the teachers are overstating or the students are understating their digital technology use.

4.3 PERCEIVED EFFECTIVENESS FOR TEACHING

A second research aim of this investigation was to investigate what the teachers think about digital technology and teaching. One simple way that this was achieved was via a Likert scale in the diary. The teachers were asked to rate the digital technology recorded in their diary from 1 to 5 (1 being very useful to their teaching). The average rating from 1 to 5 that the teachers gave digital technology in the diaries is detailed in Table 6. The ratings in session 1 ranged from 1.0 at the highest given by English, Mathematics and Music to 2.0 at the lowest given by Computing. The ratings in session 2 ranged from 1.0 at the highest given by RE, Art and English to 2.3 at the lowest given by Geography. Overall it seems that the teachers found digital technology to be very useful within their classroom teaching.

	Session 1 Average Rating (1-5)	**Session 2 Average Rating (1-5)**
Humanities 1 (Geography)	1.9	2.3
Humanities 2 (History)	1.8	2.2
Humanities 3 (RE)	1.5	1.0
Arts 1 (PE)	1.4	1.9
Arts 2 (Art)	1.2	1.0
Arts 3 (Music)	1.0	1.7
Arts 4 (Drama)	1.3	
Languages 1 (English)	1.0	1.0
Languages 2 (MFL)	1.5	1.2
Mathematics 1	1.0	
Computing 1	2.0	1.9
	1.4	1.9

Table 6: Teachers Rating (1-5)

This second research aim was enriched using interview and focus group data gathered shortly before the end of the school year. From the interviews and focus groups transcripts four categories relating to this area of investigation emerged:

digital technology positives; digital technology negatives; teachers' confidence and students' confidence. When asked if they thought digital technology was effective for teaching two teachers replied with a definite "yes" (Music and Drama) and one with a "definitely" (Maths). The Drama teacher agreed "yes, digital technology and specifically watching themselves back on video helped students make progress" and "allowed students to make steady progress". The Music teacher whose response to this comment was "ridiculous" questioned whether students could make "steady progress" merely by watching their own performance with an iPad. Although there were mentions of digital technology and progress its ability to raise achievement was not discussed.

The PE teacher stated, "It [digital technology] can definitely enhance it [teaching]. I don't think it is the only way you can improve." When questioned as to whether digital technology drives progress the humanities teachers did not fully agree: "I think not on its own it doesn't drive progress. I think it can be a useful tool." (RE); "I think good teaching drives progress first and foremost, but a good teacher who can make good use of technology can really help students progress." (History); and "I've used spreadsheets quite effectively, but I'm not really sure if it was the spreadsheet that made it effective or the meeting…but it's probably the conversation that was more helpful than the spreadsheet." (Geography). Three similar comments were recorded in the diaries: "has to be thought about and considered. It can create 'lazy' teaching and teachers"; "digital technology must be used purposefully in lessons to improve the quality of teaching" and "it cannot be used as an excuse to reduce the time and thought that goes into planning lessons".

When the teachers were asked whether their students liked digital technology one teacher replied with "yes" (PE), another with "definitely" (Maths), "students liked being filmed and could see what their performance looked like" (Drama), and the RE teacher noted "They would definitely miss it if it wasn't here." When questioned as to the digital technology engagement factor with students the maths teacher agreed “Yes, I do think it engages them. I think it’s something they’re very comfortable with.” as did the Drama teacher, “I think so”. The RE teacher disagreed “I think they get bored of it very quickly…I think kids…well all of us, we get used to things very, very quickly and so it’s possibly not the kind of exciting thing it once was.”

When asked if they thought they used enough digital technology in terms of maximising the potential of new technology to improve teaching and learning the Maths and drama teacher replied with “yes” and the music teacher referred to evidence of her digital technology use when agreeing; “looking at this [teacher diary] I do”. The PE and RE teachers acknowledged that they could use more: “I think you can always do a bit more, but in terms of productivity it does its role, fills its use.” and “I think you’ve got to make it work for you and use it to deliver what you want to deliver rather than use it because you think you should be using it.”. Whereas the history teacher identified a bigger shortcoming: “Yes, I don’t think I use enough variety of different technologies in my lesson. I tend to stick to what I’m comfortable with and I think I should maybe get more out of my comfort zone and use more that’s available.”

One teacher (Music) made the comment that she would “struggle to teach without it [digital technology]”; another (PE) recorded in their diary that a particular activity would have been "Impossible without it [digital technology]" and another still (English) noted a "Personal laptop and digital projector is indispensable to me as a teacher." Four other teachers (RE, Geography, History and English) explained their reasons for liking digital technology: “I think it gives you the ability to be flexible and spontaneous”; "allows me to be flexible, to respond to students’ needs"; “finding examples of stuff at a drop of the hat it’s invaluable”; “you can just instantly, kind of, click on and look at it” and “allows differentiation".

Five (Maths, Drama, Music, PE and RE) of the eight teachers made negative comments about digital technology relating to digital technology issues. One teacher cited “time and preparation” as reasons for not using digital technology; another identified “technical issues”; two acknowledged the schools Internet security policy as a barrier (“they’re banned” and “the only thing I feel I’m missing is Twitter”); and two considered “lack of availability of resources” and “the availability thing”. Three (Drama, Music and PE) teachers made negative comments related to digital technology student-centred issues. One teacher discussed time management within digital technology-heavy lessons: “I could probably add a good 20 minutes extra on that by the time they’re faffing about”. In addition to his fear of digital technology deskilling the students “spelling has got a lot worse just because stuff like spellcheck”. Finally, there was worry regarding the perceived ability of digital technology to distract the students: “so many distractions around them [students].”

The teachers recorded ten negative comments relating to digital technology issues in their diaries: "time consuming nature of distributing and collecting laptops and printing work"; "can sometimes be slow to load"; "problems with Internet access"; "network going down caused big problems"; "MacBook trolley was locked and the key was not available"; "a version of flash was not-up-to-date and could not run a Yacapaca quiz or Scratch"; "this often seems a waste of time"; "much more complicated task than I first thought" and "don't feel they are useful except for research". Three student-centred issues were recorded: "students often misuse them"; "many students do not use technology appropriately" and "videos via YouTube are good but should be used with care regarding over-use and students 'switching-off'".

Some teachers’ (Maths, History and English) in this study considered themselves to be confident but were both aware of their need to and willingness to improve. “I’d say pretty confident. There are some things that I need to look into and obviously improve.” “I’m confident with certain areas of technology, but really would like to be more confident in other areas.” "I have basic knowledge and use of digital technology." Four teachers (History, Music, RE and Drama) identified possible barriers to their use of digital technology teaching: “I think part of maybe holding back is not taking a risk with technology and maybe getting it wrong”; “I don’t usually use things unless I myself feel entirely competent about them”; “I can use any programme, but I can’t plug things in. that’s what stops me”; “We get so, kind of, bogged down with planning our lessons that you don’t think about trying new things”; “Not knowing what’s out there and how to use it”; “lack of exposure to it [digital technology] is one of the problems”; and "I do not find time to experiment with digital technology that I am not already comfortable with."

Finally, one teacher (Geography) described her quite relaxed view in regards to her use of digital technology. “I’m quite willing to try something that could completely fail, so in that sense I will give it a go, but I think that’s based on having, you know, a basic understanding on how most of these work and, sort of, thinking it will be fine. But, you know, also relying on the fact that you might be trying something for the first time that the kids might have used in another lesson or used at home or used in another way.” In her diary she made the comment "I do not feel overly confident with effectively using technology such as iPads and individual laptops in my lesson". The teachers made several suggestions for how their digital technology ability could be improved. These ranged from promotion within the school from an individual: “digital technology ambassador” and “a champion”; to easily achievable “practical advice” “practice” “time” “observing someone…using it well” and the more obvious “training”.

Two teachers (Maths and History) described the students as being more confident with digital technology than them. “I think they’re more confident than me.” “They know so much more about technology than I do.” Two teachers

(Music and Geography) described the students as being less confident with digital technology. “I’d say less confident.” “I think a lot of the time they’re not as confident as they think they are.” Four teachers (PE, Art, RE and History) described confidence dependent on a particular type of technology: “Email definitely not. Twitter and Facebook, stuff like that, I think they’re probably…well, I don’t know about Facebook, but YouTube stuff like that”; “they are, in terms of their relationship with technology, they’re very passive users of technology”; “they do the same things all the time”; “they’ve lost sight of the basics of IT and I think they’re not as confident in everyday stuff, but get them on the Internet and social media and stuff, they know their way much more than what I do” and “the more traditional IT stuff I probably I have a better idea about, but a lot of the Internet stuff they do.” Three teachers (PE, RE, Geography and Drama) discussed the students’ lack of general IT knowledge: “I’m surprised at how weak our students are at using email”; “it always amazes me how some of them don’t know how to save their work”; “I frequently deal with things in lessons like: what do I type into Google to find this? Where do I save it? Which button do I press to print it?” and "students sometimes do not know how to use tools and this takes time to resolve". One teacher (Music) describes her wish to impart this general IT knowledge to her students despite it not being her specialism. “I want kids to be better on things like email and stuff like that.”

In conclusion digital technology was recorded as being very useful by all of the subject teachers. There was only a variance of 1.0 (session 1) and 1.3 (session 2) between the highest usefulness rating and the lowest. There were differences in opinion between the teachers as to whether digital technology is effective for teaching and if it can drive student progress. The main opposition was in regards to the suggestion that digital technology can improve learning on its own irrespective of the teaching. The teachers agreed that the students liked digital technology and that it engaged them. However, the teachers did record many negative comments ranging from time to technical issues and distraction to deskilling. The teachers described themselves as having some confidence with digital technology but were aware of their need to gain further confidence for the benefit of the students that they teach. Though the students were considered by the teachers as being confident; their confidence is not necessarily related to traditional IT of the type expected by the teachers in their lesson.

4.5 PERCEIVED EFFECTIVENESS FOR LEARNING

A Likert scale (rating the digital technology recorded in their diary from 1 to 5) was used to enrich the data relating the students' feelings about digital technology and learning. The data from the diaries is detailed in the table below (Table 7). The ratings in session 1 ranged from 1.1 at the highest given by year 7 student 2 to 3.8 at the lowest given by year 9 student 2. The ratings in session 2 ranged from 1.0 at the highest given by year 7 student 2 and year 10 student 3 to 2.1 at the lowest given by year 10 student 2. Interview and focus group data was used to deepen the investigation into the students' views about digital technology and learning. From the interview and focus group transcripts four groupings were identified (these groupings match those identified in the teacher data): digital technology positives; digital technology negatives; teachers' confidence' and students' confidence.

	Session 1 Average Rating (1-5)	**Session 2 Average Rating (1-5)**
Year 11 Student 1	1.9	1.4
Year 11 Student 2	2.1	1.8
Year 10 Student 1	1.8	1.2
Year 10 Student 2	2.1	2.1
Year 10 Student 3	1.2	1.0
Year 9 Student 1	1.6	1.4
Year 9 Student 2	3.8	1.9
Year 9 Student 3	1.4	
Year 8 Student 1	1.6	1.7
Year 7 Student 1	1.4	1.5
Year 7 Student 2	1.1	1.0
	1.8	**1.5**

Table 7: Students Rating (1-5)

When asked if they thought digital technology made learning better four students replied with a definite "yes" (both Year 7 students, one year 9 student and one year 10 student). One Year 9 student stated, “If you need to research something that will be easier for you wouldn’t it?”; the year 10 student 1 replied with “Yes in some ways…. it’s just easier, like, looking things up instead of, like, looking through books.” but did not elaborate; however, the year 11 student did: “It depends on whether you like playing games all the time. If you do then that’s wasted on you really. If you don’t like games during lessons and you learn it’s a lot better because you’re opened up to more advanced stuff, like, you can type which is not so straining on the hands when you’re writing.” Four positive comments related to learning were recorded in the students’ diaries: "easier to understand, easier than a teacher just talking"; "I think that sometimes using technology makes things clearer in lessons"; "helped me understand" and "helps to improve learning".

When questioned as to whether digital technology drives progress the year 7 students described using headphones: “Geography, usually people are talking to each other, distracting each other, on a laptop listening to your music you focus because you’re doing the things you like. You’re on technology, you’re listening to your own music, you’re enjoying yourself, but also doing your learning at the same time.”; “Yes, it’s like that in music and drama because if you just write something and just put your headphones in you notice that the class is basically completely silent and it’s just…and we’re getting more work done, so it’s considerably better.”. This view of background music while learning, is based solely on student perceptions – there is an academic debate about whether background music helps learning – background music, instead of increasing performance (Hallam, et al., 2002; and Särkämö, et al., 2008), would actually reduce it (Perham & Vizard, 2011, p.625; and strbac, 2002). The year 9 students identified “revision.” The year 10 students acknowledged research: “when you research stuff you, kind of, progress with your learning.”, specialist software “you’ve got Photoshop and you need that to edit your photos” and different types of media “rather than use textbooks…its all like diagrams and videos and lots of websites that we can access”. The year 11 student attributed their progress to the move away from ‘chalk and talk’: “I guess you could say that an interactive whiteboards a lot better because it’s like moving on a screen, so it catches your attention more than a teacher just droning on for an hour about particles or something”.

When asked if digital technology might have raised achievement the year 11 student made a superficial reference to handwriting. A year 7 student talked about their Computing lessons: “increase my Computing levels [KS3 national curriculum levels]”. The year 9 students referred to revision again “Like, if you obviously revise for the…say we have a test and you might get the better grades you need if you learn more about what you needed to learn.” Three direct references to making progress were described in the diaries: "get us good grades"; "improve my grade" and "helped me improve my assignments".

When the students were asked if they liked using digital technology two year 10 students, two year 9 students and both year 7 students replied with “yes” and the year 11 student “I guess I do, yes”. A year 7 student wrote in her diary "I love Computing because we do fun things on the computer". The other year 7 student wrote "More fun way". When questioned as to digital technology engagement factor the year 11 student agreed but with some reservation “It can do. Although it is more of a distraction sometimes.” as did year 10 student 3 “I think, like, me personally, yes, but I think for other people who abuse it if you like then, no”. When questioned about engagement with technology the year 7 student identified a difference between the active and passive use of technology, favouring the former “Well, it depends. I like using technology, but I don’t like it, kind of, when people make you constantly watch technology, which you are most of the time.”

When asked if they thought they used enough digital technology in their learning the year 7 students gave two extreme opposite reactions, “definitely” versus “no”. When probed as to their views one student commented: “It gets on my nerves frequently that there’s too much [digital technology].”; “yes, there’s like always technology.” and “well, I just think these days everything…I don’t like it. I wouldn’t say I like it, but everything seems to be based around digital technology. I think there is enough, but it’s not used enough in school”; Later in the interview the same student makes the contradictory statement “because, I think every English lesson we use the interactive whiteboard, every maths lesson we use it.”. The year 9 students were in agreement: “Well, I think we could use it more because, like, the amount of technology we’ve got in school, but we don’t use it all at its best really.”. However again the students subsequently made a contradictory statement “Basically every lesson [digital technology is used] apart from, like, one or two if we have tests or PE.” But this is explained “Not really that much [student use of digital technology], like, there wasn’t really individual work unless it’s like music, like, the GCSE subjects they’re more individual, like, the ones that you pick.”

Two year 10 students agreed that they did use enough digital technology in their learning, however the same students had previously stated “We don’t use them [laptops].” “They’re there [laptops] and no one touches them.” Later the same students note “But, I think like already having so much of it and not using it there’s, like, no point of getting more.” Finally, the year 11 student made this comment “I think I do personally because it’s just enough to tide you over. It’s not a complete overhaul of normal work. You’re not always using digital technology yourself, but you’re always learning from it in some way, like, from a whiteboard for example. You learn from slides on a PowerPoint, take notes from that and also you learn from a teacher, but that’s not technology.” The students recorded seven requests to use more digital technology in their diaries: "we could use more technology during lessons"; "I think we could do with more use of technology in lessons"; "isn't used enough, there are a lot of opportunities where technology could be used, but isn't"; "the same boring use for technology, maybe we need to make technology more exciting more of the time"; "maths is bothering me we always use the same kind of technology in it and it's frustrating"; "we as a school have loads of technology available to use but it's not often used" and "the amount of technology we have in the school; not enough teachers incorporate them in their lessons". One student contradicted this view reporting: "sometimes it's good to have lots of technology but I prefer the balanced use" and "I think the level of technology in School A is perfect as it is".

One student from each year group made positive comments related to their feelings towards digital technology: “you remember it more really because you’re having to search for it and then you know if the answer’s correct”; “It’s easy to operate”; “I think we’re all used to it, like, from home and at school”; “It’s easy”; and “a lot quicker”. Three students (year 9, 10 and 11) described its ability to support independent learning: “I can work on my own and do a lot more on my own rather than being in a big classroom with everyone causing a disruption”; “easier to learn when you’re, like, on an individual basis”; “we can, like, learn at our own speed”; and “it allows me to go off and do things myself rather than have to…without distraction”.

One student from each year group made negative comments about digital technology. Technical issues were described: “bad connection”, “they’ve blocked everything”, “It’s too unreliable”, “lags and freezes and you lose all your work”, “It just never seems to work…we will probably end up missing about an hours’ worth of lesson”; and “waiting for it to load”. Student-centred issues were also described: “social media being used, like, when you’re on it people get distracted and go on other things”; “because people are just going on the internet and like…yes, because if you get laptops they listen to music and don’t do their work”; “generally people just play games on them I think, so it’s wasted upon them sorts of people” and “when a teacher wants to talk you’ve got the technology it’s just like I still want to carry on, but the teachers like, no, put your lid down”. Only one student recorded a technical issue in their diary: "the board was a problem".

Six students (two year 7, three year 10 and year 11) in this study considered themselves to be more confident in their use of digital technology than their teachers: “they seem to be very tentative when using technology as if like, oh, if I touch this it might go wrong or if I don’t do this it might not work”; “If they’re more confident in themselves they’re more confident in the technology”; “A lot of them if they’re older they’re used to being, like, blackboards or, you know, not having the technology”; and “I would say that because they weren’t brought up alongside technology they wouldn’t be as confident, but now they’re teaching with it they could become more confident with it because they’re using it to teach and they’re using it repeatedly, so they get used to it a lot more”. One student (year 9) thought confidence might be dependent on the type of software. “It depends what the software is really, like, Photoshop some teachers won’t know how to use it obviously, but then in Photography and Art they’ll know more than what we know.” The students made a few suggestions for how the teachers’ digital technology ability could be improved. This ranged from: the obvious “a course or something” and “training”; to the simple “by using it more so they get used to it and know what it does, know you press this button that happens, then they’ll get more confident and they’ll use it more”; to the more interesting “listen to students, like, they could help if we know how to do it”. The students all described themselves as “very confident” and “confident”.

In conclusion digital technology was recorded as being very useful to neither useful nor useless (1.8 in session 1 and 1.9 in session 2) by the students, this was lower than that reported by the teachers (1.4 in session 1 and 1.5 in session 2). All of the students agreed that digital technology is effective for teaching and can drive student progress by improving their grades; that they liked digital technology and that it engaged them. The majority (ten out of eleven) of the students felt that more digital technology should be used in their lessons. The students, like the teachers identified technical issues and distraction as negatives of digital technology. Most of the students thought that they were more confident when using digital technology than their teachers because they had not been brought up with technology. They made several suggestions (ranging from practise to training) for how their teachers' digital confidence could be improved.

Students have a positive view of digital technology and link its use to their present and future success "Technology is the language of now" and "if you don't know things about computing you probably won't actually get that far". The students describe technology as being "easier", "quicker" and well able to support independent learning. Some teachers talked about digital technologies making learning "accessible" to the students, however most pro-digital technology sentiment was aimed towards how digital technology could help make teaching easier rather than how it could aid learning. This could explain two teachers' comments: "I think sometimes it's, kind of, shoehorned in and actually we should use it to assist our teaching, but not necessarily use it because it's there" and "I think there can be the danger with technology you can make lessons flashy, but not purposeful and I've seen some examples of that, not just here, but in my previous school. I think sometimes less is more in terms of technology". If teachers do not see the learning merit of digital technology then they will not use it; one possible interpretation of these findings is that if the students could share their understandings of digital technologies' merits with the teachers they would be more likely to make use of them in their lessons.

5 DISCUSSION

The structure of this chapter aimed to follow the final thematic analysis map which can be seen in Figure 7. The nodes (ovals) became the sections and the subnodes (rectangles) became the subsections.

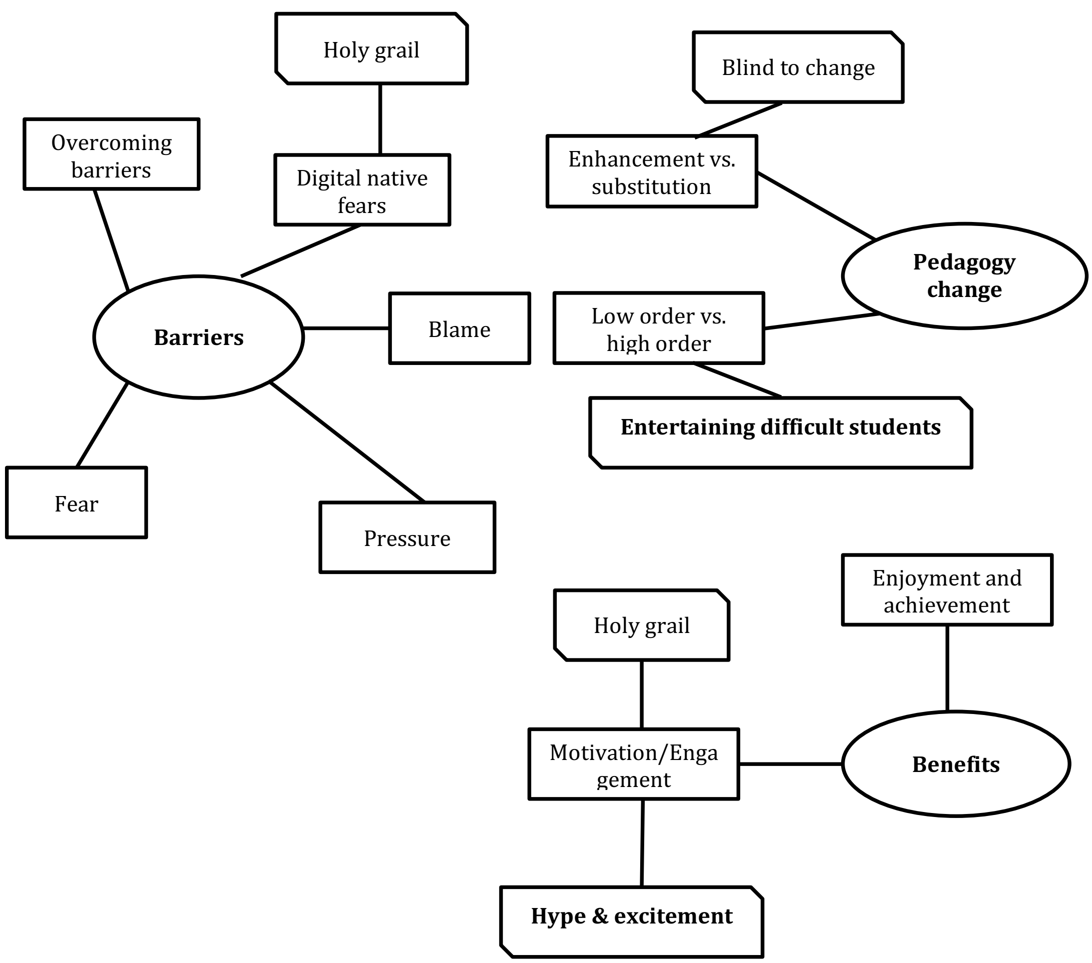

Figure 7: The Final Thematic Analysis Map (Version 4)

5.1 PEDAGOGY CHANGE

5.1.1 SUBSTITUTION VS. ENHANCEMENT

Substitution and enhancement as described in Figure 7 refer to the juxtapose position of digital technology use in the classroom which completely replaces an older method (PowerPoint replacing overhead projector film) in comparison to one that which simply enhances it (books being used alongside iPads). There have been some claims that interactive whiteboards are effective classroom teaching tools in secondary education (Bletcher & Lee, 2009; Tomei, 2013; and Pour, 2013). In School A there is some evidence from this study to suggest that the data projector, rather than 'entire' interactive whiteboard experience appears to have become a replacement for the old teachers' blackboard because they make life far easier for the modern teacher. This is a view partly supported by Cakiroglu (2015, p.252) who note that interactive whiteboards make teaching easier, quicker and increase interest; in school A this is true only for the data projector part of the interactive whiteboard and precludes its interactive features.

An incidental benefit of the teachers' PowerPoint (which is projected onto their whiteboard) is that it can double as a lesson plan, which negates the need to write a formal plan thus saving the time-stretched teacher precious time: "I think for a lot of teachers now actually a lesson plan is your whiteboard, I usually use PowerPoint most lessons instead of writing a lesson plan, that is the lesson plan." The teachers do not need to take the time or effort to write anything out during the lessons, "You just display your instructions, don't you? You use it for a timer. You use it for, you know…I even use it for dates and titles. I don't even write them on the board"; and to some degree they don't even need to remember or know the content, "We are literally giving people [non-specialist teachers] here's a lesson and PowerPoint is by far the easiest way to do that because, you can put your notes on PowerPoint for the teacher to see…you're giving little hints and instructions". If technology makes things easier and quicker, as the interactive whiteboard, projector and PowerPoint clearly do, then you will not have to struggle to secure their uptake in the classroom. Robey (1979, p.537) conversely notes that a system that does not help people perform their job is not likely to be received favourably in spite of careful implementation efforts.

This study presents a complex and varied picture with only one of the eight teachers (maths) describing their use of the interactive features of the whiteboard and of the eight students interviewed they only identified three (maths, science and history) of their teachers as using the interactive features of whiteboards. If, as can be seen with the interactive features of the whiteboard, a technology is seen as too much effort for the expected benefit it provides, it will not be used, “I never use the interactive [features of the] whiteboard”. Teachers do not find the interactive features of the whiteboard useful and perceived usefulness (extent to which technology will help people perform their job better) has been empirically verified as the most important predictor of technology usage (Branscomb & Thomas, 1984; Chin, et al., 1988; Davis, 1989; Venkatesh, et al., 2003; Kim, et al., 2007; Lee, 2010; El-gayar, et al., 2011 and Shneiderman, 1987); according to commitment theory and continuous adoption of technology (Zhang, et al., 2014), usefulness, ease of use, personalisation and learning costs are the main variables that affect people’s adoption of new media (Domingo and Garganté, 2016). In contrast to the view of the interactive whiteboard completely substituting the old style whiteboards one student makes this point: "I don't think the smart board is any use unless videos or other media because the old school whiteboards are still around”. By virtue of the fact the original whiteboards still exist in the school gives at least one student the impression that the interactive whiteboards are not necessary or in fact useful. This parallel use of new and old technology could be one possible reason why the merits of digital technology are frequently called into question.

The teachers seem to be using the iPads primarily as a research tool for quick access to the Internet during their lessons: “I don’t think they’re particularly useful for anything else”; and “in my room I have a trolley of 30 iPads. I only use them for students when carrying out research". This opposes the view that iPads/mobile technology provides a range of new ways to learn from a variety of different perspectives (Boticki, et al., 2015; Furio, et al., 2015; and Domingo and Garganté, 2016). However, some students were positive about iPads for researching, "it's just easier like, looking things up instead of, like, looking through books"; whereas others were negative, "they just give it to us to research, but we have plenty enough books to do that". It could be concluded that students view technology as an enhancement to the learning process rather than a substitute for it (Galbraith and Haines, 1998) because they still see the merit in using books for research. iPads should not simply be used as a replacement for a trip to the school library. This narrow view of their use (how often did lessons need to be taught in the school library?) along with their supposed tendency to distract students could explain why they are used so infrequently.

“They are quite limited in their use” - this view is at odds with the literature surrounding iPads which suggest mobile technology can not only facilitate access to information (Yang, et al., 2015; and Domingo and Garganté, 2016) and provide new ways to learn, but can also increase learning engagement (Lu, et al., 2014; Gerger, 2014; and Domingo and Garganté, 2016), foster autonomous learning, promote collaborative learning (Murphy, 2011; and Domingo and Garganté, 2016) and grant access to hundreds of thousands of specialised, functional and transformative Apps (Johnson, et al., 2013; and Domingo and Garganté, 2016). However, the teachers in School A consider iPads to have one purpose unlike computers and laptops, which they consider to be multifunctional. If teachers cannot see the positive impact of mobile technology then this will be negatively correlated with their use in classrooms (Boticki, et al., 2015; Churchill & Wang, 2014; Furio, et al., 2015; Gerger, 2014; Jahnke & Kumar, 2014; Lu, et al., 2014; Murphy, 2011 and Yang, et al., 2015). The teachers did not discuss what they thought about their use of laptops or desktops in the same way they had for the iPads. Though one teacher did describe the use of laptops as a “palaver”; little educational value for time and effort expended (Li, 2007, p.392). They did not comment on whether they were difficult to use, or how they could be a distraction.

The predominant use of iPads in School A for Internet research seems to be at odds with much of the research which suggests the use of apps as a major and very different feature of educational iPad use. Portability, the touch screen feature, ease of use, long battery life, and affordable hardware and software are just some of the features that have led to their uptake in schools (Geer, et al., 2015, p.1). Coughlan (2014) notes that O’Gradaigh has used tablet computers – in his case iPads – to produce digital textbooks that can be downloaded and shared by Irish language schools. The teacher-training centre in the university in Galway has become part of this digital-self publishing enterprise with eighty trainee teachers learning to make their own digital content and finding the best ways of using their own expanding library of materials. Its success is so great that there are schools which are deciding not to buy books anymore (O'Gradaigh, cited in Coughlan, 2014). Digital technology has opened up the possibility of schools becoming publishing houses (Kelleher, cited in Coughlan, 2014). However, there is some opposing research which highlights the challenges with implementation, including a lack of teacher apps and resources and significant amount of time needed in finding the right apps for lessons (Liu, et al., 2016, p.160). Montrieux, et al. (2014) concludes that sufficient professional development before, during, and after tablets implementation is necessary to support teachers’ successful use of iPads in the classroom.

Word processing software is a final example of substitution, to some degree it has completely revolutionised the way in which student coursework/controlled assessment is completed and ultimately submitted: "drafting coursework using computers, had they been writing their coursework and going back and editing it by hand we wouldn't have got anywhere near the level of accuracy"; "it allowed students to format their work and also check spellings"; and "print out work in neat. Better presentation". The students also refer to the merits of word processing albeit in a simpler way, considering only the hand ache and time associated with extensive writing: "you can type which is not so straining on the hands"; "when I write too much my hand starts aching"; "it's so much easier and so much quicker to just type it up"; and "instead of spending ages writing it by hand I just typed it up". Both the teachers and students are unanimously positive about digital technology for word processing.

Digital technology is frequently used to enhance lessons, this ranges from: video clips which are used by most teachers (seven of the teachers), "you could show kids a clip of and they instantly get a much better understanding than you could ever give them or they could ever read"; to music used by some (two of the teachers), "I might use songs or music as discussion starters"; and games used by specific subjects (Maths and Computing), "Maths Watch and My Maths and those types of software". Video clips on practically every subject are available for free through YouTube, YouTube is again a technology in which teachers can see the clear benefits and both teachers and students report its regular usage in lessons: "YouTube videos to kind, of, get the hook into your lesson"; "I sometimes use YouTube because they can give you, like videos to help you"; "video provided a varied source of information"; "through YouTube powerful clips and images can be used to put across the past in different ways"; and "YouTube has enabled a wealth of video clips and digital resources to be used within lessons. It has enabled me to show short, powerful clips that help illustrate a point and create more of an impact when introducing and trying to open up topics". The prolific use of YouTube supports the idea that if teachers perceive a technology as having a positive impact, that is, the instructional benefits of the technology are significant then this positively correlates with the use of that technology in their classrooms (Badia, et al., 2014; Inan & Lowther, 2010 and Van Braak, et al., 2004). Technology integrated into classrooms is designed by teachers for the benefit of students (Gu, et al, 2013, p.392), it therefore follows logically that if a teacher sees the benefit for the students they will be more likely to use the technology.

There was a lot of evidence to support the view that digital technology for admin in teaching is truly embedded: "research, planning, it makes a huge difference"; "I do use it [interactive whiteboard] for my department meetings"; "supporting my department with new legislation and protocols that are coming out"; "this saved printing lots of paper"; "countdown bomb timer"; "registers"; "how I create and store work."; "email staff regarding pupils"; and "use Twitter to develop awareness of all the good work going on in the PE department and get messages to students and the computer screens around school". In contrast to the view that digital technology is being used solely at the admin level and has not changed pedagogy and practice (Cuban, 2001; Cuckle, et al., 2000 and Laurillard, 2009) these results suggest that some admin uses are in fact evidence of change: countdown timers and Twitter.

There is evidence of some seemingly small ways in which digital technology has revolutionised teaching and learning in School A: whiteboards, projectors and PowerPoint for whole class teaching; Internet for planning and research; and Word processors for coursework/controlled assessments. Digital technologies could be thought of as effecting teaching and learning in one of two ways: substitution, whereby digital technology (interactive whiteboards) completely replaces equipment (blackboards); or enhancement, whereby digital technology (Internet research) adds to the learning process by working alongside equipment (books). When digital technology substitutes another teaching method there are concerns that due to its abundant use in School A the teachers and students become blind to the pedagogical change that has happened. Conversely, when digital technology enhances a teaching method and is employed in parallel with other non-digital approaches there is the feeling that digital technology is not beneficial to learning or teaching and has not changed pedagogy in a noteworthy way.

5.1.2 LOW ORDER VS. HIGH ORDER

Low order and high order as described in Figure 7 refer to the two different styles of learning which digital technology can support: low order (engaging, motivating and remembering) and high order (creating and evaluating). Digital technology use was more frequently described for lower order factors (45 instances, where instances relates to the number of times a participant in the study refers to a particular idea either in their diaries or during the interview/focus group), such as motivation than higher order thinking (37 instances), such as creating. Higher order thinking is more desirable for attaining quality learning (Kimber & Wyatt-Smith, 2010, p.609). The low order learning described by the teachers included: "grabs their attention", "remind students", "fact check", "scaffolding" and students: "watch technology", "watching movies", "search stuff on Google", and "English to Spanish translation". Most teachers (excluding the maths teacher) described digital technology as supporting research: "independent enquiry"; "independent research and things"; "researching is just invaluable" and "using computers for research can be an amazing tool". The exact type of research would need to be known in order to categorise research as either high or low level learning.

Kimber & Wyatt-Smith (2010, p.607) question the sufficiency of simply engaging with digital technology to developing higher order critical and creative skills. Building deep, conceptual understanding and higher-order thinking requires intensive teacher-student interactions, and technology sometimes distracts from this valuable human engagement (OECD, 2015, p.3). The higher order learning described went beyond engagement and motivation to include: applying, "it was a thinking skills game using images and dates on the whiteboard"; analysing, "performance analysis stuff"; evaluating, "we sometimes write book reviews", "allows peer and self-assessments" and "easier for pupils to self-assess"; discussing, "it got the students discussing, piecing information together" and "helped to develop discussion with the students"; and creating, "using Scratch is great as it teaches a skill (coding) and allows creativity" and "Dreamweaver enabled a level of creativity"

Despite research to support the idea that digital technology enhances collaborative learning and assists with the participatory and constructivist classroom (Bereiter, 2002, and Laurillard, 2009), the students in this study heralded the opposite view. Two students described how digital technology allowed them to work on their own, "I can work on my own and do a lot more on my own rather than being in a big classroom with everyone causing disruption" and "easier to learn when you're like on an individual basis". There was no reference to collaborative learning or teacher as facilitator, however this view of learning as an individual activity could be born out of the students enjoyment of listening to music with headphones while they work: "usually people are talking to each other, distracting each other, on a laptop listening to your music you focus because you're doing the things you like"; “without music like I said it makes us unfocussed and if you listen to music you can't hear other people talking and you don't want to talk, so people aren't distracted”; and "if you write something and just put your headphones in you notice that the class is basically completely silent and it's just…and we're getting more work done". One student expressed concerns about the amount of work being completed while listening to music, “if you get laptops they listen to music and don't do their work". Digital technology being used in this way may support Perrotta’s (2013, p323) fears that digital technologies are used to minimise disruptive behaviours by “difficult” students.

There is evidence that digital technology is quite often used for high order learning in School A (a difference of only 8 instances between digital technology for high order use and digital technology for low order use) – this could be thought of as yet more confirmation in favour of their having been a slight pedagogical change and an indication that digital technology may be beneficial to teaching and learning. However, there was nothing to support the idea that digital technology can strengthen collaborative learning. It may be that because digital technology changes are happening in a smaller and slower way than that heralded by the government and technical evangelists (Crook, 2005; and Selwyn, 2012) that the very real changes that are happening, are underrated and under celebrated.

5.3 BARRIERS

5.3.1 BLAME

Blame as described in Figure 7 refers to the blaming of various actions or events in preventing the successful integration of digital technology into teaching and learning. Gu, et al, (2013, p.393) notes that barriers include - lack of specific knowledge, lack of skills about technology integration, attitudes and beliefs towards technology, lack of confidence and competence, negative attitudes and inherent resistance (Gu, et al, 2013, p.393). However, many teachers in this study described technical issues connected to using digital technology: caused by lack of teacher knowledge, "I don't use the visualizer because mine's not plugged in"; network issues, "network going down caused big problems"; software issues, "a version of flash was not-up-to-date"; and hardware issues, "using iPads outside it difficult this time of year [autumn] because of weather". Many students shared different descriptions of technical problems: caused by broken hardware, "it's not fixed [interactive whiteboard] and then you come three lessons later and it's still not fixed"; speed and reliability, "It just lags and freezes and you lose all your work"; and the schools firewall, "they've blocked everything". The technical issues associated with digital technology could be thought of as being blamed for its limited use. If teachers and students hold the view that a particular classroom-teaching tool (digital technology) is likely to be unsuccessful then they may be more reluctant to use it. Huffman, et al (2013, p.1781) also notes that computer hassle, the factors that make the use of some type of technology challenging (for example, a computer could have a slow download time) decreases self-efficacy; decreased self-efficacy and confidence can in turn reduce digital technology use. Computer self-efficacy and personal innovativeness have been empirically verified as being associated with positive technology use (Lewis, et al., 2003; Thompson, et al., 2006 and Gu, et al, 2013, p.398).

The teachers but not the students described availability and time (Haydn, 2001) as barriers to digital technology use: "if I had a trolley of either MacBooks or iPads or something in my lesson, like, in my room all the time, yes, I probably would use them more"; "lack of availability of resources"; "the MacBook trolley was locked and the key was not available"; "everything has to be a big task to warrant using them [laptops]"; "time consuming nature of distributing and collecting laptops and printing work"; and "much more complicated task than I first thought.". Despite the apparent usability of laptop trollies compared with the 'old style computing labs' teachers still associated their use with being a time-consuming ordeal, "this often seems a waste of time". Time is a major consideration for teachers; both in regards to actual teaching time (which cannot be wasted because of the pressures of exam results) and preparation, "I haven't got time for that or I'll do that next year". Davis (1989, p.321) notes that self-efficacy research suggests that 'perceived ease of use' and 'usefulness' are basic determinants for digital technology use. Many teachers must consider the relative merits (usefulness) of the digital technology versus the time and effort expended in its use, "is this a worthwhile sacrifice [digital technology for time]?".

In contrast to the view of digital native students whose knowledge of all things digital far surpasses that of their teachers; four teachers discussed the seeming digital weakness of their students: "it amazes me how some of them don't know how to save their work"; "they can find ridiculous videos from all over the world, but they can't actually do necessarily, you know…you say practical things we [teachers] were sort of taught to do"; "they've lost sight of the basics of, you know, IT"; "how weak our students are at using email"; "get them on the Internet and social media and stuff and they know their way much more than what I do"; "students sometimes do not know how to use tools and this takes time to resolve" and "In terms of their relationship with technology, they're very passive users of technology". These observations differ from that of the digital native students who are thought to frequently use technological products, and not experience difficulties with the use of complex technological products (Rainie, 2006). The teachers describe students who are purely avid *consumers* of digital content, a very different view to Prensky (2001) and Tapscott (1998) who posited swaths of young digital native experts creating and inventing digital content that their digital immigrant teachers cannot even imagine! The teachers understanding of their digital native students is in accordance with more recent research which suggests that digital natives are not as proficient in the use of digital technology as expected (Akçayır, et al., 2016; Cameron, 2005; Thinyane, 2010; Thompson, 2013 and Thompson, 2015).

The students blamed each other for not using the digital technology correctly and becoming distracted by the Internet, games, selfies etc. They were very quick to describe how “other” students misuse digital technology: "generally people just play games on them I think, so it's wasted upon them sorts of people"; "when you're on it people get distracted and go on other things"; "people are just going on the Internet"; "people take selfies on the iPads instead of actually doing their work"; "other people who abuse it."; and "many students do not use technology appropriately". This view is supported by Crook (2012, p.72) who notes that students are vulnerability to distraction; increasing complexity and sophistication of digital technologies brings “significant distractions and obstructions” that young people must confront (Crook, 2008). One student identified a potential barrier as being, “a lack of trust between students and teachers". The students were also vocal in blaming their teachers and the school for what they perceived to be an inadequate use of digital technology in their lessons: "I think there is enough, but it's not used enough in school"; and "the amount of technology we have in the school; not enough teachers incorporate them in their lessons".

These barriers (technical issues, time, availability, weak students and easily distracted students) are how the teachers justify not using digital technology more in their teaching. Some of the barriers that can be thought of as being blamed for reducing digital technology use are similar to the first-order barriers (lack of access, time, training and support) described by Tsai & Chai (2012, p.1057) and have not changed in the past 10 years (Kennedy, et al., 2008; Cho, et al., 2003; Hargittai, 2002; and Levin and Arafeh report, 2002) despite the technological advancements as well as over 10 years of IT/Computer science being taught in schools.

5.3.2 FEAR

Fear as described in Figure 7 refers to fear of digital technology which prevents its successful integration into teaching and learning. Two teachers made negative comments related to the worry that personal mobile devices in a classroom can be a distraction: “the amount of distraction versus the amount of productivity you get out…you can basically kiss good bye to a grade right there and then”. This view of attainment and distraction being interrelated is supported by other researchers who observed that students who actively used their mobile phones or other digital technologies generally performed lower than students who did not engage in these behaviours (Kraushaar & Novak, 2010; and Wei et al., 2012). One recent study suggested that a mobile phone ban improves the probability of a student attaining a C or better on five GCSEs by 2.01 percentage points (Beland and Murphy, 2015, p.17) Wilshaw (2012) and Bennett (2015) claim that mobile phones are a distraction to student learning and are advocates of school wide mobile phone bans. The teachers also worried that mobile digital technology can be a distraction: “you give a child an iPad and depending on your relationship with them it can go terrible places”. Beland and Murphy (2015, p.17) support the teachers view by stating that multipurpose technology can have a negative impact on productivity through distraction. This could be due to highly-distracting irrelevant content detracting from the encoding process, which allows students to actively process information to be recalled later (Kiewra, et al. 1991). Research on iPads has also highlighted challenges with implementation, such as student distraction and difficulty in monitoring students’ use (Liu, et al., 2016, p.160). The students’ worries about digital technology mirrored that of their teachers: “social media being used” and “people get distracted”. These same two teachers associated distraction with digital technology in general: "I just can't trust that they will be on the websites that they should be"; "they think they can just listen to music and not really work that hard"; "a smoke screen" and "more of a distraction sometimes".

Although the teachers’ fear of being replaced by digital technology in the future as referenced by Li (2007, p.392) was not directly referenced by either the teachers or students in this study; the fear of becoming entirely dependent on digital technology was. “I don’t think I can teach without it now” and "I'd struggle to teach without it and it scares me" was the fear voiced by a teacher who would be moving to a school with access to less digital technology. Another teacher worried that his students would become too dependent on digital technology to the point that they may not be able to function on their own, “there’s a danger that we have deskilled them to the point where technology makes it so easy and can be such a great advantage that they’ve lost some of the, you know, basic skills of self-sufficiency” and "computers don't work therefore I can't work". The PE teacher worried about the literacy competency of his students, "even more spelling has got a lot worse just because stuff like spellcheck". Similarly, two students referenced the idea of self-sufficiency and in particular the fear that digital technology can lessen it, "so we are not always learning from technology, so we can use like books and our own minds instead of always having technology to help us" and "sometimes we need to do it by memory". Some teachers and students appears to be of the opinion that digital technology rather than being a tool to support learning is more like a crutch which when relied upon too frequently can take away both independence and abilities.

There was a fear among some of the teachers that by using digital technology they may unwittingly show the students that they are fallible, "I think it's more my, kind of, insecurities and some of the times the kids come into lessons and they know so much more about technology than I do" and "I think they're more confident than me". These fears (projectorless teaching, mobile phones, distraction, digital technology dependence and students as experts) daunt teachers and may cause them to use less digital technology in their teaching. These fears can be thought of as being blamed for digital technology not being used more, these are outside of the first-order, second-order (teachers’ personal and pedagogical beliefs) and third-order barriers (design thinking) proposed by Tsai & Chai (2012, p.1057).

5.3.3 DIGITAL NATIVE FEAR

One teacher was frank and open about her positive views on digital technology and her students. “It’s fear of other people thinking if I’m using technology kids are going to go, oh, look at the world it’s amazing. When actually they can do that on their own device and do it all the time anyway”. This comment was made in reference to school A’s banning of social media and the technicians fear of videos containing images of the children in the school being posted on YouTube. She described herself as being proactive in regards to teaching with digital technology and ensuring that she was delivering a rounded education to her students including cross curricular IT, “I think actually it’s really important for them to just be able to pick up any programme and not go I can’t use this or I can’t use that”. She was candid about her view of how teachers and students’ views and indeed usage of digital technology differs, “they couldn’t live without their phone in the same way that we couldn’t live without a ballpoint pen”. This teacher’s view is evocative of Prensky’s (2001a) digital native; digital natives are more sophisticated in their usage of the Internet, “smart” mobile phones, mobile devices than the prior generation (Akçayır, et al., 2016, p.435). She is not fearful of her digital native students but rather is positive about the future of digital technology in lessons and indeed in the lives of the young people she teaches, “why would you want them to live without it? It’s brilliant. They’re brilliant”.

Gu, et al, (2013, p.392) and Prensky (2001) state that current students are more knowledgeable and technology savvy than their teachers when it comes to ICT (Gu, et al, 2013, p.392). However, Bennett & Manton (2010) and Brown & Czerniewicz, (2010) note that digital natives are by no means an identifiable generation defined solely by age. Guo, et al. (2008) found no significant differences in ICT competencies between digital natives and digital immigrants. One teacher made this observation about students’ technical ability, "I think a lot of the time they presume because of the generation and the frequency with which they use them that they're better". This idea was confirmed by two of the student’s: "because they [teachers] weren't brought up alongside technology they wouldn't be as confident" and "they [teachers] seem to be very tentative when using technology as if like, oh if I touch this it might go wrong or if I do this it might not work". However, one student made the following concession regarding his teachers’ digital skills, "now they're teaching with it they could become more confident with it because they're using it to teach and they're using it repeatedly, so they get used to it a lot more". Another student made a distinction based on the teachers’ subject knowledge, "Photoshop some teachers won't know how to use it obviously, but then in Photography and Art they'll know more than what we know”. This seems to confirm the opinion that teachers’ can become digital natives through experience (Akçayır, et al., 2016, p.439; Helsper & Eynon, 2010, p.510 and Teo, 2015).

This study suggested that students have higher self-efficiency and confidence in using ICT than teachers (Gu, et al, 2013, p.399). One teacher commented on their students’ ease around digital technology: "I think it's something they're very comfortable with". This was a sentiment echoed by the students: "you get used to being brought up with technology" and "I think that to be comfortable with yourself and your own technology is key." This is supported by Dornisch (2013, p.210) who notes that some students have higher levels of skill and comfort with respect to technology than do their teachers. One reason frequently given for negative perceptions of technological ability is low technology self-efficacy (Igbaria & Iivari, 1995), decreased personal belief as to how well they can perform a task (Huffman, et al, 2013, p.1779). The teachers in the study described in detail their lack of confidence with digital technology which it turns out could be thought of as a lack of understanding in their own abilities: "I haven't really had much experience of using apps"; "I'd love to be able to use relevant apps and things on YouTube"; "special apps to, like, help you"; "I would love to try and use mobile phones more in lessons and try to use it a bit more creatively"; “I definitely need to be more open-minded and use more variety”; "would like to use more creatively"; "I'd like to use in an out of school way"; "I do not exploit the apps available through the iPads"; "I'd like to find out more creative ways of using the iPads"; and "I do not feel overly confident with effectively using technology such as iPads and individual laptops in my lesson". The teachers’ description of how they would ideally like to use digital technology in their teaching referenced apps, the iPads, creativity and the unknown. Research suggests that hundreds of thousands of specialised Apps are available to extend the functionality of mobile technology (Johnson, et al., 2013) and the transformative nature of Apps has helped mobile technology become a popular and powerful tool in education (Domingo and Garganté, 2016); however, the teachers in this study are struggling with how to use both apps and iPads. They want to use digital technology in a new exciting way, which uses cutting edge applications of digital technology. However, they don’t know how to go about this but feel it is what they should be doing. In short they are searching for the digital technology version of the Holy Grail.

Two teachers described how mobile phones are ingrained in student culture an idea backed by Kuznekoff, et al. (2015, p.346) who note that mobile phones and other connected devices are a ubiquitous features of modern life: "they would go to war for their phones"; "they couldn’t live without their phones"; and “technology is so embedded in their culture with selfies and phones and everything". The same teachers also highlighted the differences in the relationships that students have with their phones in comparison to their teachers: "we're not ever going to use it [mobile phone] in the same way they [students] are or view it in the same way they are". It could be thought that there is a generational difference; digital natives are more sophisticated in their usages of the Internet, ‘smart’ mobile phones, and mobile devices than the prior generation (Akçayır, et al., 2016). However, this generational view of the digital native has been contested with Teo (2013) stating that not every young person today is a digital native; and Palfrey & Gasser (2013, p.14) preferring to call digital natives a population rather than a generation, which they feel, is an overstatement.

School A contains many ‘digital natives’ who their teachers feel are experts with social media, ‘smart’ phones and consuming website content; they are less apt with the digital technologies and software that their teachers associated with education and formal schooling. The teachers in School A are doubtful about their students’ digital skills and certainly where not able to endow them with digital abilities which could be said to traverse the entire population of students. In addition to concerns relating to their students’ digital ability were concerns regarding their own, particularly in regards to iPads and Apps; despite this concern there was evidence that the teachers excelled in technology related to their subject area (this idea is discussed in more detail in Section 5.6).

5.3.4 PRESSURE

The teachers identified four categories of pressure: the students, “I probably feel it more with the kids" and "there's more pressure from the kids to try and use it because they know it's here"; themselves, "if students within my lessons are engaged with digital technology I need to look for more ways to engage the students within my lessons using digital technology" - (educators are failing them [students] by not adapting instruction to their needs (Prensky, 2001b, p.442, 2001c; Rosen, 2010 and Tapscott, 2009, p.368); the cost of the digital technology itself, “you do have to pay for the computers and everything" - (pressure derived from monetary, political and commercial investment (Fluck & Dowden, 2011, p.8)) and "I feel they are a waste of money"; and the staff "I don't feel any pressure at all from staff to actually use it”. One teacher remarked that he initially felt under pressure from the staff/school to use the digital technology, "there was a real need to be using it all the time" however, that this pressure had diminished over time, "backed off the idea, oh, if you’re not using it you’re not doing good teaching". This same teacher shared his determination to use digital technology for the advantage of his teaching despite these pressures: "I think you've got to make it work for you and use it to deliver what you want to deliver rather than use it because you think you should be using it". Depending on the type of pressure and from who could have an effect on how teachers employ digital technology in their teaching; surface level digital technology use to tick boxes or planned digital technology use for deep learning.

5.3.5 OVERCOMING BARRIERS

The teachers and students made several surface level suggestions for overcoming the barriers and fears (technical issues, time, availability, weak students, easily distracted students, mobile phones, distraction, digital technology dependence and students as experts). Two teachers suggested "a champion" and "a digital ambassador”. Four teachers suggested “practical advice” for “modelling good practice”, "filming a five-minute clip of them using it" and "resource base to give people an idea of how I can practically and physically work in a lesson". One teacher and one student suggested practice, “practice. I know what it is, it's just having the time to get there" and “using it more so they get used to it and know what it does, know you press this button and that happens, then they'll get more confident and they'll use it more". This reinforces the view that more exposure to an experience will increase self-efficacy (McCoy, 2010), which in turn increases digital technology use. Two students suggested a “course or something" and "training”. One student suggested a student mentor, “listen to students, like, they could help if we know how to do it". The same student made this comment; "I don't think teachers should be afraid to use the students’ digital technology skills within lessons". This puts a new angle on the teachers’ fears of the digital expert; who are offering the teachers their support. There is neither one single barrier nor will there be one single method for overcoming the barriers; rather than searching for the one solution it is more important to provide teachers with a number of different choices from which they can choose their own correct answer.

5.4 BENEFITS

5.4.1 ENJOYMENT AND ACHIEVEMENT

Three teachers described their students’ enjoyment while using digital technology in their lessons: "they actually want to use it", "different format to an otherwise dull task" and "students liked being filmed”. Although certain of the students’ apparent enjoyment there is little exampled evidence. Similarly, only three of the students included a positive description of their experiences to back up their view of digital technology: "you're on technology, you’re listening to your own music, you're enjoying yourself, but also doing your learning at the same time", "I love Computing because we do fun things on the computer" and "more fun way". Eight of the teachers and eight students affirmed with a “yes” or “definitely” when questioned as to whether students enjoyed using digital technology. This confirms the results of Li’s (2007, p.387) study that technology can increase student enjoyment of learning.

Eight students (three in interview and five in diaries) made comments linking digital technology and academic achievement. These comments ranged from “confidence" and "understanding” to "clarification" and “improved learning”. Three students referenced grades: "get good grades", "get us good grades" and "improve my grade". One student talked about using digital technology to "help me improve my assignments" and another to "help me to revise as I could go off and work at a pace". Only one teacher made a positive comment related to digital technology and achievement, "allowed students to make steady progress". Two teachers apposed this view calling into question whether it is in fact the digital technology which causes the achievement, or rather whether it is the good use of that digital technology by the teacher: "not on its own it doesn't drive progress. I think it can be a useful tool" and "good teachers who can make good use of technology can really help students progress".

Much like the views of the students (who made links between digital technology and achievement) and teachers (who questioned the links between digital technology and achievement), which are split, so too are the conclusions of previous research. For example, Coleman (2011, p.7) states that there is not a huge amount of evidence to support the view that pupils' school achievement will improve with the introduction of new technologies; however, in the same year DFE (2011, p.10) reference two large studies (the ImpaCT study and the Test bed project) which found statistically significant positive relationships between the use of ICT and achievement in mathematics, English and science.

5.4.2 MOTIVATION AND ENGAGEMENT

Digital technology has been linked to an increase in pupil engagement and improved learner engagement, amongst other benefits (Basham, et al., 2011, p.25; Brooks, 2012, p.14; and Perotta, 2013, p.314). Learning performed through mobile technology has also been linked to more engaged students whose interest to accomplish educational tasks is increased (Gerger, 2014; and Lu, et al., 2014). However, there is anxiety that children's engagement with digital media is limited to their passive, solitary, sporadic and unspectacular recreational activities (such as video gaming, social networking sites, video, image and music sharing, music and image editing and animation using online and other resources), which might not necessarily equate to the skills and competencies associated with traditional literacy, digital literacy or collaborative communities of content creation (Hague & Williamson, 2009; and Livingstone, 2009).

Two teachers in the interview/focus groups briefly mentioned engagement in a positive way, "I think so" and "I do think it engages them". In comparison to this limited reference to engagement (two) is the high number (twenty-four) of positive comments relating to engagement in the teacher diaries: "got students focused and engaged", "helped to get some less settled students engaged", "increased engagement", "engaged non-participants" and "introduce the protest movement in a more engaging way". The disparity in the number of engagement comments included in the diary when compared to the interviews/focus groups is in itself interesting. During the interviews very little time was given to recalling the students' levels of engagement with more time spent discussing matters related to fear and blame. In contrast to this the comments taken from the diaries mainly related to engagement and pedagogical change with far fewer comments relating to fear and blame. This could be due to a number of reasons, however it seems apt at this time to be reminded that diaries as a data collection tool were selected because of their ability to record small snapshots in time by allowing feelings, perceptions and behaviour to be recorded immediately thus reducing recall errors (Duke, 2012). In addition, it may be important to highlight the discrepancy between the negativity in the focus groups when compared to the interviews. The teachers in the focus group were much more vocal in sharing their negativity towards digital technology, than the single teacher in the interview or in their teacher diaries. Perhaps being in a group of their peers gave them the confidence to voice their true feelings or perhaps these negative feelings where falsified or exaggerated in order to fit in with the group thinking.

Motivation as opposed to engagement was indicated five times in the teacher diaries, "encourages more students to contribute" and "a potential 'carrot' to encourage interest". Digital technologies ability to motivate students was considered far less than simple engagement. The hype and excitement ("everything was shiny and new" and "it was a real kind of buzz around it") surrounding digital technology although initially leading to engagement with familiarity can result in a loss of interest and eventually boredom (“we get used to things very, very quickly and so it's possibly not the kind of interesting thing it once was" and "I think they get bored of it very quickly"). This may identify another possible explanation for teachers not wanting to use digital technology if their repetition of ‘uses’ in their lessons, though initially successful ‘when new’ becomes unsuccessful when ‘used’ more regularly. This could further explain why teachers are constantly seeking ‘new’, interesting and creative ways to use digital technology. They are chasing ‘the Holy Grail’ because of and for their ever-changing students’ desires.

5.5 PRACTICE PROFILES

Software use by the teachers in School A was studied (see chapter 4.1, Table 2): setting website activities for the student (38.4%), PowerPoint for whole class teaching (16.9%), setting specialist/subject specific software (11.9%) and specialist/subject specific software related activities with websites (10.6%) for the students, setting word processing activities for the students (5.7%), video clips for whole class teaching (5%) and setting PowerPoint activities for the students (0.7%). Wang, et al., (2014, p.645) investigation of twenty-four middle school science teachers from two states determined that they use word processing, spreadsheets, presentations, text messaging and web search engines tools at least once a week inside of school. Gu, et al, (2013, p.397) random sample of ten teachers from five schools identified office programs, such as Microsoft Office and word processing software in addition to multimedia (generally videos) as most frequently used in classrooms. All three studies identify the high use of Office software in the classroom; two of the studies identify website usage; and two studies identify video clip usage. This study was alone in its high frequency use of specialist/subject specific software applications for learning. This difference could be related to the diverse range of subjects that the teachers in this study taught (humanities, arts, languages, mathematics and computing); the Gu et al study did not specify the subjects of its teachers and the Wang et al study was solely science teachers.

In addition to the barriers previously discussed it has been suggested that where teachers struggle to adopt, or seem to resist, technology integration, a contributing factor may be a ‘cultural clash’ between that subject area and use of digital technology (Goodson, et al, 1995; Howard & Maton, 2011; and Selwyn, 1999). It could be suggested that if a teacher does not feel that digital technology supports the teaching of their subject for their students then they will be less likely to use it. This idea is supported by Ertmer, et al., (2012) who notes that teachers are likely to use strategies and tools they feel support their teaching aims and are relevant to student learning. It can be supposed that the values and norms of some subject areas fit better with computers, suggesting fundamental components of the subject area may match or clash with technology integration (Howard, et al, 2015, p.25). The teachers' subject area was investigated as an important factor for digital technology use in the classroom and can be seen in Table 8; research has identified that subject areas have an effect on technology integration (Goodson, et al., 1995; Hennessy, et al., 2005; Howard, et al., 2015; and Selwyn, 1999). Table 8 outlines the digital technology that was used separated by subject area, for each digital technology the length of time it was used is presented in minutes, hours and as an average. A total has also been calculated for each subject area.

	Digital Technology Used	**Length of Time (mins)**	**Length of Time (hrs)**	**Average Time (hrs)**
Humanities (Geography, History & RE)	Interactive Whiteboard + Laptop (including PowerPoint) - Teacher use	1252	20.9	65%
	YouTube	159.4	2.7	8%
	Timer	45	0.8	2%
	Visualiser	30	0.5	2%
	Laptops + Internet	400	6.7	21%
	iPads + Internet	30	0.5	2%
	Total	**1916.4**	**31.9**	**21%**
Arts (PE, Art, Music & Drama)	Interactive Whiteboard + Laptop (including PowerPoint) - Teacher use	238	4.0	8%
	Interactive Whiteboard + Laptop (including DVD/CD - Teacher use	31	0.5	1%
	Interactive Whiteboard + Laptop (including class video clips) - Teacher use	150	2.5	5%
	Interactive Whiteboard + Laptop (including still images) - Teacher use	23	0.4	1%
	Interactive whiteboard + Laptop (including Photoshop +DSLR Camera/iPads) - Teacher use	540	9.0	18%
	Interactive whiteboard + iPad - Teacher use	20	0.3	1%
	Interactive whiteboard - Teacher use **(Total)**	1002	16.7	33%
	YouTube	14	0.2	0%
	Timer	20	0.3	1%
	Visualiser	50	0.8	2%
	Laptops/Computers + word processing	250	4.2	8%
	Laptops/Computers + scanners	20	0.3	1%
	Laptops/Computers + Specialist software (Garageband, Sibelius & Photoshop)	590	9.8	19%
	Laptops/Computers + Internet	100	1.7	3%
	Laptops/Computer + Printer	10	0.2	0%
	iPad camera + playback	670	11.2	22%
	iPad + Printer	10	0.2	0%
	iPads + Internet	240	4.0	8%
	DSLR Cameras	80	1.3	3%
	Lighting + sound	15	0.3	0%
	Total	**3071**	**51.2**	**34%**
Languages (English & MFL)	Interactive Whiteboard + Laptop (including PowerPoint) - Teacher use	915	15.3	51%
	Interactive Whiteboard + Laptop (including Microsoft Word) - Teacher use	325	5.4	18%
	Interactive Whiteboard + Laptop (including DVD/CD) - Teacher use	180	3.0	10%
	Interactive whiteboard - Teacher use **(Total)**	1420	23.7	79%

	YouTube	40	0.7	2%
	iPad camera + Playback	20	0.3	1%
	iPad - SEN students to watch video	20	0.3	1%
	iPads - Translation for EAL students	10	0.2	1%
	iPads + Subject specific software (Accelerated Reader)	20	0.3	1%
	Laptop/Computers + word processing	200	3.3	11%
	Laptop/Computers + Subject specific software (Linguascope)	60	1.0	3%
	Total	**1790**	**29.8**	**20%**
Mathematics	Promethean board (including software) + Laptop + visualiser - Teacher use	1020	17	100%
	Total	1020	17	**11%**
Computing	Interactive Whiteboard + Laptop (including PowerPoint) - Teacher use	100	1.7	8%
	YouTube	35	0.6	3%
	Laptops/Computers + Internet + Subject specific software (Lightbot, Scratch)	265	4.4	21%
	Laptops/Computers + Internet	75	1.3	6%
	Computers/Laptops + Specialist software (Photoshop, Terminal, Dreamweaver & Virtual box)	500	8.3	40%
	Computers/Laptops + Internet	55	0.9	4%
	Computers/Laptops + PowerPoint	215	3.6	17%
	Computers/Laptops + Email	100	1.7	8%
	Total	**1245**	**20.8**	**14%**

Table 8: Digital Technology Use Categorised by Subject

Humanities (65%), Arts (33%) and Languages (79%) main use of digital technology were the interactive whiteboards, laptops and PowerPoint. Computing's use of the interactive whiteboard, laptop and PowerPoint was much lower (8%) and Mathematics did not use PowerPoint at all, instead they used an interactive whiteboard, laptop and Promethean software in combination with a visualiser (100%). Humanities and Art had relatively low visualiser usage (2%) when compared to Mathematics (100%). Humanities had the highest use of YouTube (8%), followed by Computing (3%) and Languages (2%). Laptops and the Internet was the secondary usage for Humanities (21%), but had a much lower usage for Arts (3%) and Computing (4%). The main use of digital technology in Computing was computer/laptop with specialist software (40%), with half that usage by Arts (19%). The secondary usage within Computing was computer/laptop with subject specific software (21%), with much lower usage for languages (3%). The secondary usage for Arts was iPad camera and playback (22%), with much lower usage for languages (1%). A brief teacher digital technology profile for School A has been outlined in Table 9.

Subject	Profile	Use
Humanities	1. Interactive whiteboard, laptop and PowerPoint 2. Laptops/Computers/iPads/personal digital devices and Internet access 3. YouTube	Teacher use Student use Teacher use
Arts	1. Interactive whiteboard, laptop and PowerPoint 2. iPads/cameras and playback 3. Laptops/Computing and specialist software	Teacher use Student use Student use
Languages	1. Interactive whiteboard, laptop and PowerPoint 2. Word processing	Teacher use Student use
Mathematics	1. Interactive whiteboard, laptop and Promethean software 2. Visualiser	Teacher use Teacher use
Computing	1. Laptops/Computing and specialist software 2. Laptop/Computing and subject specific software	Student use Student use

Table 9: School A Digital Technology Practice Profile

In regards to teaching related administration all five subjects areas prepared some kind of presentation outside of lesson time (using either Promethean or PowerPoint software) to be shown to their students via the interactive whiteboard during their lessons. Pre-prepared course materials can be reused again and again so that interactive whiteboards save time for planning, developing effective resources and easy access to information and resources (Euline, 2010; and Hall, 2011). Again perceived usefulness and ease of use are significantly correlated with self-reported indicants of system use (Davis, et al., 1989, p.333). Interactive whiteboards are a substitute for standard whiteboards/blackboards; they have replaced the traditional black boards in many educational institutions (Becta, 2006).

The humanity teachers frequently used YouTube in their teaching, "with so much History on the Internet and through YouTube powerful clips and images can be used to put across the past in different ways". The use of YouTube could be thought of a multifunctional: intended to facilitate high order learning by explaining difficult concepts, "explains something really difficult"; as well as low order learning by engaging the students, “engaged students by watching the video clip - gave them a focus and was a different way of introducing life in a work house". The Arts teachers frequently used iPads video recording and playback in their teaching, “watching their own performance with an iPad”. Again the iPads purpose can be thought of as multifunctional: high order learning, “performance analysis stuff”; and low order learning, "engages students as it’s THEIR pictures being analysed from last week".

The mathematics teacher made regular use of the visualiser for high level learning in their whole class teaching, "I cannot be without the visualiser. It's not limiting in the fact that on a whiteboard I have to rub everything off if I want to write something else down." The visualiser has perhaps become so readily integrated into and embedded in the everyday classroom because it can be used in ways that fit well with existing pedagogic practice in English schools (Mavers, 2009, p.24). The mathematics teacher was able to model difficult mathematical concepts using the visualiser without being limited by the Activinspire software; the modeller can write and draw with a variety of mark making substances and tools (e.g., pens, pencils, crayons, rulers, etc.) and on different surfaces (e.g., plain, lined, squared, coloured paper).

The computing ("Dreamweaver enabled a level of creativity") and arts teachers’ ("we use Photoshop all the time, you can't teach without it") made consistent use of specialist software in their lessons. Four constructs frequently mentioned as the predictors of ICT acceptance: perceived usefulness, level of assistance in performing tasks, social influence and personal factors including computer self-efficacy and personal innovativeness (Gu, et al, 2013, p.393). For these subjects (Computing. Art, Photography and Music) specialist software exists (Dreamweaver, Terminal, Photoshop, GarageBand and Sibelius), is useful for teaching the subject and can assist in performing certain subject related activities; e.g. Photoshop can be used to easily and quickly alter a photograph. Computer self-efficacy may also be having an effect; the teachers are experts at using their software, which is usually the industry standard with a real life use in their particular field, “Photoshop some teachers won't know how to use it obviously, but then in photography and art they'll know more than what we know". The Computing teacher also made consistent use of subject specific software (Lightbot and Scratch) probably for similar reasons to those outlined above. Finally, the Language teachers use word processing software, which closely meets the needs of their subjects; Word processors can be used as a much quicker and easier substitute for paper and pen, "drafting coursework using computers had they been writing their coursework and going back and editing it by hand we wouldn't have got anywhere near the level of accuracy".

In conclusion, to support learning for their students teachers choose to use technologies that match key features of their subject areas (Howard, et al, 2015, p27). If the teachers feel that digital technology is of benefit to their students for their subject then they will make use of it, "we use Photoshop all the time" and in many cases become experts in its use, "Photoshop some teachers won't know how to use it obviously, but then in photography and art they'll know more than what we know". Perhaps the teachers are using digital technology in a way that is best for teaching their subjects; not every lesson or every topic is taught best using digital technology. Surely it is much better for teachers to discerningly select digital technology whose use will support their students learning than to add it wholesale into every lesson.

5.6 RELIABILITY AND LIMITATIONS

I had a relatively close and positive working relationship with the teachers and students in this study; they might be more likely to be open and honest in their responses, or at least less subject to the pressures and agendas involved in school inspection processes, government sponsored official enquiries and teacher associated surveys (Haydn, 2014, p.40). However, it was still important to be aware of self-presentation and impression management; in addition to the danger that teachers and students may be inclined towards giving answers that they felt might please me (Haydn, 2014, p.40). Finally, the data collected was about students' and teachers' perceptions and it is known that there can be clear discrepancies between what is perceived by an individual and what is actual (Cats-Baril & Huber, 1987; Dickson, et al, 1986; Gallupe & De-Sanctis, 1988; McIntyre, 1982 and Sharda, et al., 1988).

One notable aspect that arose from the teachers' interview data was the use of the word "honest". Three teachers (PE, RE and History) in two of the focus groups used this word: "the web-two I don't really use to be *honest*"; "if I'm *honest* about my current practice I don't use hardly anything on there [digital technology list given during focus group]"; and "I tend to use a lot of it for display being *honest* with you". It could be that this term has been used in order for the teachers to show that they are sharing their "honest" version of what they perceive to be the truth. Alternatively, it could have been simply a turn of phrase. It seems unlikely that these statements are deceptive though because their intention is not to make the teachers look as if they use a lot of digital technology but rather them admitting that they use it less. The Maths teacher identified her underestimation of how much digital technology she actually used, "perhaps I underestimate how frequently I use that as well". The RE teacher identified her misunderstanding of what was meant by 'digital technology', "that's my misunderstanding of what you meant" as she had not realised that interactive whiteboards counted as digital technology. Both the teachers' underestimation and misunderstanding support the idea that teachers are blind to the digital technology change that has happened in education, because of being too deeply immersed within it.

Contradictions were another feature of the interview data, with the teachers and students making statements and then negating them later. The RE teacher made a positive comment about the use of iPads, “that is really good with the iPads, it can be literally a ten-minute task” followed by a declaration that she did not use them often, “I don’t use the iPads particularly often”. The PE teacher described his frequent use of iPads in lessons, “the iPads particularly when we’re doing gymnastics and dance, so at them times of the year probably, I don’t know, five lessons out of ten”; however, this was later contradicted by three students: “not PE though because you can’t use that”; “obviously in PE there’s no technology used, so the iPads can be used outside as well, so…No, they don’t, so that could be one”; and “basically [digital technology is used] every lesson apart from, like, one or two if we have tests or PE”. The PE contradictive statements could be an example of impression management in action and calls into question the reliability of the teachers’ or students’ data. It could be that either the teacher is falsifying information in order to cover up a perceived shortfall in their teaching practise because they feel they should be using the iPads more often; or it could be that the students are forgetting that they use iPads during PE lessons because it happens only at certain times of the year. In addition to the effects of impression management is the truth that the data collected was the teachers’ and students’ subjective appraisal and does necessarily reflect objective reality (Davis, 1989, p.335); when perceptions are collected bias is inevitable due to self-reporting (Gu, et al, 2013, p.400). Either way, the validity of this data cannot and should not be taken for granted as the data collected may have been subject to impression management, subjective appraisal or bias.

6 CONCLUSIONS AND RECOMMENDATIONS

6.1 SUMMARY

6.1.1 STUDIES RATIONALE

This study was initially driven by a personal and professional interest, as a teacher of Computer Science in an English secondary school, in the affordances of digital technology for teaching and learning; through this interest a familiarity with some of the digital technology research and debates developed. It was thought that teacher and student perceptions regarding the systems and practices of digital technology use in School A (where I was employed as a teacher and which had a mission/ethos which strongly promoted the use of digital technology, and where the views and priorities of the Senior Leadership Team (SLT) were closely linked to the development of effective use of new technology to improve teaching and learning) might provide further insight into these issues and debates. It was this interest in addition to the knowledge that digital technology in education and the attempt to improve its use in the classroom is a high profile worldwide concern (Convery, 2009 and Fluck & Dowden, 2011) which further guided the undertaking of this research. See chapter 1 for more detailed development of this explanation.

6.1.2 DIGITAL TECHNOLOGY ISSUES AND DEBATES

The main strands identified as part of the digital technology debate included:

1. The focal overarching issue as being the extent to which digital technology might improve educational outcomes in schools.
2. The factors that influence teachers' use of new technology.
3. The forms of new technology (applications and forms of use) thought to be most helpful for improving teaching and learning by the students and teachers
4. Students views on the use of digital technology – including for learning, engagement and commitment to learning.
5. Teachers' attitudes to digital technology.
6. The extent to which mobile technology is useful in the classroom.
7. The extent to which students 'digital natives' are ahead of their teachers in the use of digital technology.
8. The extent to which digital technology use helps 'high order' thinking.

Though there is some empirical evidence to support the view that digital technology can benefit students' learning (DfE, 2012; DfE, 2011; and Harrison et al., 2002) there is yet more evidence to suggest that digital technology use in the classroom has very little impact on student performance due to a lack of digital technology endorsing pedagogies. Recent OECD (2015, p.15) findings, based on a PISA data analysis, suggest that, despite the pervasiveness of information and communication technologies (ICT) in our daily lives, these technologies have not yet been as widely adopted in formal education; where they *are* used in the classroom, their impact on student performance is mixed, at best. An absence of technology promoting pedagogies have been blamed for this lack of enthusiasm and impact (OECD, 2015, p.3). Digital technology for raising attainment is discussed in detail in chapter 2.2.3.

The factors that have been suggested as influencing a teacher's use of digital technology in their classroom are many and varied. They range from reliability issues to teacher time constraints and from perceived digital technology usefulness to teachers' length of service. It is easy to attribute low usage in the classroom to the teacher's control (Gu, et al, 2013, p.399). The influencing factors are discussed in detail in chapter 2.1.1. Teachers' attitudes to digital technology are often blamed for its perceived failure in transforming education (Albion, 1999; Cavenall, 2008; Cummings, 1996; Gove, 2012; Harrison, et al, 2002; Perrotta, 2013 and Wilkan & Molster, 2011). Easdown (1997) suggests that teachers are 'Luddites' who are hostile to the use of digital technology, or are not capable of realising its potential because of their own limitations (testbed project, Somekh, 2007 and Convery 2009). Teacher attitudes are described in further detail in chapter 2.1

There is considerable controversy surrounding mobile technology use in schools and its positive or negative impact on students' education. There are those (Bennett, 2012; and Wilshaw, 2015) who would suggest that personal mobile devices in the classroom are a disruption and advocate a total ban of such devices. Bennett (2012) states that mobile technology disrupts lessons and Wilshaw (2015) advocates head teachers who don't worry that confiscating mobile phones could infringe human rights. However, there are others (Kuznekoff, et al., 2015; and Domingo & Garganté, 2016) who acknowledge the benefits of smart phones and their potential for learning in the classroom. Tablet computers in education are another contentious issue with some research advocating its use in schools (O'Gradaigh, cited in Coughlan, 2014) and yet others warning against their implementation challenges (Liu, et al., 2016) and unguaranteed success (Faloon, 2015; and Frey, et al., 2015). This study uncovered mixed, predominately negative views towards mobile technology from the teacher participants, with students being more positive in their views. The research suggests that context might be an important issue here, with levels of teacher/school control an important issue. Certainly, this study suggested that some teachers were concerned that mobile devices might serve as a distraction to students, supporting the views expressed by Bennett and Wilshaw. The implications for schools and senior management teams is that they need to consult staff to ascertain their perspectives on this issue. It is also important to bear in mind that School A may not be typical in terms of levels of control over student activity. Further discussion of mobile technology for raising attainment can be located in chapter 2.2.1 and tablet use in education in chapter 5.1.

The phrase digital native coined by Prensky (2001a), whereby all people born after 1980 are naturally proficient in their use of digital technology, is still a pervasive idea today despite the growing body of academic research that has questioned the validity of this concept (Akçayır, et al., 2016; Czerniewicz, 2010; Helsper & Eynon, 2010; and Teo, 2015). These more recent findings suggest that being born after 1980 is only one predictor for being a digital native and indeed there are no significant technical ability differences between the so called digital natives and their digital immigrant teachers. The idea of the digital native is discussed in chapter 2.2.2.

It was important to determine if my research would shed any light on these debates. The wide and varied debates surrounding digital technology in education directed this investigation towards an in-depth case study of teachers' and students' attitudes in one school (School A), in an attempts to update insight and explore these issues through a more detailed and human-centred lens than that of RCT's and other large scale quantitative studies such as the biennial Department for Education surveys in the 1980s and 1990s (see Haydn, 2004), and studies such as ImpaCT 2 and the Testbed project.

6.1.3 RESEARCH QUESTION FORMULATION

It was initially planned that this study would focus only on the views and practices of the teachers in School A, however as a result of the literature review and initial exploration of the issues an attempt to also elicit the views of the students was decided upon. There was some discussion concerning the involvement of a parental perspective on new technology use, but logistical and time considerations militated against this. Therefore, students' and teachers' perceptions about the effect of digital technology on teaching and learning in School A were studied in order to link these views to the debates about digital technology use in education.

- How exactly did teachers use digital technology in their lessons? What do they think about digital technology and teaching? Are there any subject specific differences or similarities?
- How exactly are students experiencing digital technology in their lessons? What do they think about digital technology and learning?
- What light does new technology use on School A shed on the current and recent debates about the use of new technology in schools? (See Section 6.2 for a brief summary of these debates and controversies).

A thorough description of the aims and research questions can be found in chapter 1.3.

6.1.4 FACTORS AND THEORY INFLUENCING THE RESEARCH DESIGN

The research ontology of this study was realism as it was believed that it would harmonise well with the complex social world in which a school operates and take account of the human aspects of the people (teachers and students) who function within it. It was thought that realism would consider how the participants interacted and related to the digital technology available in School A. The preferred methodology for this investigation was case study due to its ability to provide a detailed account and deep understanding of a social question which involves events (use of digital technology) and actors (students and teachers) in a bounded system (School A). A case study approach is a very detailed process and can provide thick data and descriptions. A mixture of case study selection approaches which provided a zone of combined purpose (Stake, 2003, p.137) was used for this research: deviant case study – School A differs from other schools because of its enthusiasm for and access to digital technology; intrinsic case study – School A is being studied because it is naturally interesting as I work at the school; instrumental case study – School A is important as it provides access for investigating digital technology use which is the primary interest of this study; and convenience – finally it is important to acknowledge that there was some degree of selection based on convenience; I work in school A so gaining access to this school was unproblematic.

The instruments employed as part of this study were diary and interviews/focus groups. The diaries were used to collect detailed information about the participant's behaviours and the events that they were involved in at School A which may otherwise have been forgotten. A dairy which used a combination of structured questions, free text and a Likert rating scale was utilised so as to provide a wide-ranging and detailed data set. The interviews and focus groups allowed the issues arising from the diaries to be subjected to an in depth exploration. The interview/focus group style followed a guided approach so that they could retain a freedom to alter the course of the questioning and maintain an unimposing conversationalist feel. A theoretical or purposive sample (range of males and females, differing ages/career stages and subject specialisms) with an element of convenience sampling was used to select fifteen students and fifteen teachers from School A.

In terms of the implications of this study for other researchers in this field, I certainly found it helpful to use the diary data collection method supported by an interview/focus group. I feel it allowed the participants to achieve a more detailed level of recall when describing their actual use of digital technology in teaching/learning. It provided an important starting point from which to position the interviews/focus groups. The comparison of the teachers' and students' perspectives was an essential part of this study as it allowed a detailed multiple standpoint view of digital technology use in the modern classrooms. In addition, it allowed for theories and conclusions to be tested for validity, albeit in a fairly modest way.

6.2 FINDINGS

6.2.1 IMPACT OF DIGITAL TECHNOLOGY

One key conclusion of this study is that although there is no strong evidence that the availability of digital technology at School A has led to utopian change it has caused some small yet significant grassroots changes. "Students love getting 'hands on' [when using digital technology] and taking control of their learning." The ‘big claim’, ‘cutting-edge’ and expensive digital technologies: interactive whiteboards, visualisers, iPads and radio room have not transformed education as claimed or expected. "Danger with technology you can make lessons flashy, but not purposeful." To some degree it appears to be easier to raise the funds to buy digital technology that it is to find the time to use it. "I haven't got time for that or I'll do that next year." There has however, been a steady incremental improvement in technology use, which continues today. Teachers and students alike are generally positive about technology and it is this that drives these small unremarkable changes in its use. "Without question the current generation are so media-influenced and conditioned to respond to digital technology, you'd be a fool not to use it." This change has been so steady and incremental that many, including the teachers’ and students’ directly involved in it have been ‘blind’ to this change.

The ‘killer applications’, the ‘game changer’ digital technologies have not been the hi-tech cutting edge technologies but rather the everyday, cheap and readily available hardware and software: YouTube, World Wide Web, Data projectors, presentation software and word processors. In School A the data projector and presentation software seem to have made the biggest difference to both the students (“we use them [data projectors] in almost every lesson”) and teachers ("the whiteboard projectors are pretty crucial"). The students and teachers are exposed to this technology on an hourly basis and it forms the very core of their teaching and learning in the modern classroom.

There are a number of researchers (Becker, et al, 1999; Cuban & Kilpatrick, 1998; and Cuban, et al, 2001) who agree that the actual use of digital technology in schools typically falls well below the expectation set by technology proponents. It could be these over exaggerated expectations are making the reality of digital technology use in today's classrooms seem further diminished in comparison. The actual impact of a technology depends on both the teachers and students who use it (Gu, et al, 2013, p.392); the teachers and students in School A are feeling the impact of digital technology, albeit in a smaller way than that predicted by the technologists and expected by the UK government. These findings are supported by Wang, et al. (2014, p.651) who also discovered that Word processing and presentation tools were the most frequently used applications in developing curriculum related materials and web browsers for conducting research.

6.2.2 INFLUENCES ON THE USE OF DIGITAL TECHNOLOGY

The research conducted in School A does bear out the idea that if a digital technology is both useful and easy to use then it will be readily exploited by teachers in their lessons: "***useful*** to respond to pupils as necessary by showing images/websites using the Internet"; and "so quick and ***easy*** to look things up [on the Internet], not only for my teaching in the classroom, but also for supporting my department with new legislation and protocols that are coming out." Similarly, if a digital technology is not thought to be useful then it will not be used: "I feel they [interactive whiteboards] often prove ***nothing more useful*** than a display board"; and "don't feel they [iPads] are ***useful except*** for research". The majority of teachers is School A only used the interactive whiteboards as a projector and display screen (ten out of the twelve teachers) and the majority of teachers only used iPads as an Internet research tool (nine out of the twelve teachers) as they did not perceive that they were useful for any other purpose.

An alternative view of teacher technology acceptance apparent in School A is related to teacher confidence in relation to digital technology use. There is some evidence that teachers who didn't feel confident about using a technology shied away from its use in their lessons: "I do not feel overly confident with effectively using technology such as iPads and individual laptops in my lesson"; and "I'm just not that confident for making them [video clips]". This relationship between confidence and digital technology use was also noted upon by a year 7 student. "Using it more so they get used to it and know what it does, know you press this button and that happens, then they'll get more confident and they'll use it more." It could be concluded that a mixture of teacher confidence and competence in addition to digital technology (hardware/software) usability and ease of use are important to successful digital technology integration.

It appears that reliability is still perceived as an issue in School A despite the school's up-to-date digital technology devices and infrastructure. The unreliability of technology was blamed for lowered technology use in School A by six teachers: "technical issues"; "network going down caused big problems"; and "incompatibility of my school issued mac and sims (register) functionality as this often leads to my laptop freezing/loading". The teachers in School A were not questioned directly about whether their negative experiences with technology reliability affected their confidence and therefore their technology use. However, it may be theorised that in the very least digital technology problems in School A make digital technology use unappealing to its teachers.

There is an extensive body of research which determines that teachers' perceptions of usefulness (Badia, et al., 2014; Inan & Lowther, 2010; and Van Braak, 2004) and ease of use are significantly correlated with self-reported indicants of technology use in classrooms (Davis, 1989, p.333). Conversely, if an application would objectively improve performance, if users don't perceive it as useful, they're unlikely to use it (Alavi & Henderson, 1981). However, there are other researchers that determine that self-efficiency, confidence and ICT competency are the vital factors in determining ICT adoption and successful ICT integration (Bingimlas, 2009; Gu, et al, 2013, p.400; and Hew & Bush, 2007).

If it is accepted that self-efficacy has an effect on digital technology integration in the classroom it can also be supposed that technology hassle can negatively affect this integration. Those individuals who have increased experience with hassles related to technology (technology reliability issues, such as, compatibility and Internet access problems) are more likely to have decreased self-efficacy (Huffman, 2013, p.1781), where self-efficacy is linked to technology use in teaching (Gu, et al., 2013). Huffman, et al. (2013, p.1781) supports this idea by noting that structural technology support, how well an organisation provides the basic tools to use the desired technology (up-to-date equipment, computer help desk and fast Internet access), can affect technology self-efficacy.

6.2.3 TEACHER AND STUDENT VIEWS

The study suggests that teachers are cautiously positive about the potential of digital technology, whilst sometimes feeling a bit guilty that they are not at ‘the cutting edge’ of digital technology use. The teachers’ in School A describe their belief in digital technology for the future of schooling, classroom teaching and education as a whole. "Without question the current generation are so media-influenced and conditioned to respond to digital technology, you'd be a fool not to use it [digital technology]." The teachers appear to agree that digital technology is a necessary part of teaching for the betterment of the students and their future rather than being just for the direct improvement of their teaching now. "Whatever they work in, whether they're an actor or musician or an online technician or anything they've got to be able to communicate quickly and function using technology really well." This study seems to contradict that of the ‘luddite’ teacher (Easdown 1997) who fails to see or respond to the potential of digital technology for education.

The students mirrored their teachers in their belief that digital technology is an inescapable part of their future. "Technology is the language of now." There is a tension between thinking of digital technology in terms of teaching and learning ("I think that digital technology makes me more confident in my learning"), in terms of their future (“it is the future and everything is developing into bigger and better things”) and to some degree the whole world ("helps us connect with the whole world"). This view of digital technology for their future success may be a driving force behind their desire to use it more in their lessons. "We could use more technology during lessons." ICT integration in classrooms is done for the kids (Selwyn, 2003); the impression held by some researchers and the UK government is that digital technology is not fulfilling its potential (Gu, et al, 2013, p.400); this is not so surprising when its potential for life, let alone education, is imagined to be so vast. This study supports the findings of research by Selwyn (2012) and Crook (2012), that effective technology integration in education is not simple or straightforward.

6.2.4 MOBILE TECHNOLOGY

In School A there was very little evidence of iPad apps being used for learning or teaching. The only use of the iPads reported by the students was Internet research (100%); while their teachers reported using iPads in their teaching for video recording and playback (49.5%), Internet research (27.3%), video recording and playback in conjunction with Internet research (18.2%), apps (2%), video clips (2%) and for accessing translation software (2%). It seems that the teachers in School are only utilising the hardware (camera – "iPads just to film, like, performances and to show students how they've performed") and operating capabilities (Internet access – "I think for things like a quick research task they're very useful") of the iPads, rather than the software (apps). As a direct result of the teachers not using the iPad apps in their teaching are their feelings of guilt ("I do not exploit the apps available through the iPads") and their desire to improve this area of their practice ("I'd love to be able to use relevant apps"). In the instance of School A it could be thought that the apps currently available for education in specific subjects (Humanities and Arts) are not of use and therefore not being used. Juxtapose to this are the apps for Computing (binary game) and Maths (MathsWatch) which are considered useful and so are used.

In contrast to the views on iPad usage in school A is a growing body of knowledge that has identified affordances including the increasing number of educational apps as having the potential to enhance student learning (Alyaha & Gall, 2012; and Barnes & Herring). Geer's (2015, p.3) study describes one strength of the iPad as being the educational apps which not only provide access to a wide range of resources, but access to apps, such as iMovie and GarageBand that have been designed to allow students to be innovative creators of knowledge. In Geer's study 60% of the students where using iPads to browse the web, and approximately 40% where using educational apps at least six times a week (Geer, et al., 2015, p.5). The usage of iPads in School A is notably different to that described in Geer's research (2% versus 40% app use). In further support of the usefulness of apps for education are the results of an RCT study in Malawi, associated with the OneBillion project and involving 400 children using a tablet-based maths-teaching app for 30 minutes a day found tablet use to be more effective for learning mathematics than existing practice (Pitchford, 2015).

There is some researcher in support of School A's teachers' views; much of what was observed as beneficial about the iPad is a product of the hardware and operating capabilities as opposed to the design of the applications developed for the device (Murray & Olcese, 2011, p.46). While the ideas on how people learn has greatly expanded, the bulk of the applications written to run iOS devices are woefully out of sync with modern theories of learning and skills student will need to compete in the 21st century (Murray & Olcese, 2011, p.48). As with all hardware, what makes a difference in how devices are adopted by teachers and how and what applications are developed to take advantage of the hardware specifications (Murray & Olcese, 2011, p.45). If teachers do not find the apps that have been developed useful, then they will not use them. Finally, Couture (1997) recognises that a chronic sense of insufficiency in the face of insurmountable challenges and inadequate support translate frequently into a sense of guilt and frustration rather than opposition. The teachers are not opposed to using iPads they are just struggling to use successfully in conjunction with apps in their teaching.

This study seems to suggest that at least some teachers found that using ICT could make learning better, and teaching easier. It is important therefore, that teachers are open to new technology. They do not have to be experts, but rather they should be prepared to experiment together with their colleagues. It may be worthwhile for school management to encourage and develop a community of practice. This would provide a platform from which teachers potentially in conjunction with their 'tech savvy' students to share their expertise and enthusiasm more effectively.

6.2.5 DIGITAL NATIVES

Some ideas relating to the digital native debate arose from this investigation. There was evidence to support the idea that students are not all digital natives who are automatically experts with all digital technology. There were statements to confirm the view that some students still struggled with digital technology, particularly in regards to the use of traditional IT software: “really a lot of them don't have a clue [about digital technology]"; and "they've lost sight of the basics of, you know, IT". However, there was the acceptance by the teachers of the students’ IT proficiency in relation to the world wide web: "get them on the Internet and social media and stuff and they know their way much more than what I do". It could be that being a digital native is a skill to be nurtured in students at opposed to a generation for whom teaching methods should be altered. It could be thought that rather than being digital immigrants due to their University education and prolonged experience with digital technology the teachers are in fact digital natives. There is some evidence in School A to back up this claim: "the more traditional IT stuff I probably have a better idea about". This is particularly true for teachers of certain subjects and their use of specific software; for example, an Art teachers use of Photoshop or a Computing teachers use of Dreamweaver. The truth about the digital native appears to be much more complicated than simply, people born after 1980 due to their having been raised with technology, are innately more sophisticated in their digital technology use.

Ackayar, et al. (p.439) study provides empirical evidence to dispel the popular belief that all people born after 1980 are digital natives. It is thought that digital native traits are situated and by no means shared across the entire generation (Brown & Czerniewicz, 2010 and Sanchez, et al., 2011). Being a digital native is not an innate talent, but the result of acquired skills that can be developed over time (Akcayir, et al., 2016, p.439). Varela-Candamio, et al. (2014) further the idea that a university education can makes individuals more likely to be digital natives;

with increasing levels of education people become more competent in using technology.

In terms of how this study relates to other research in this field, the findings indicate that the idea of digital immigrants and digital natives may be overstated. Some teachers were very capable in their digital technology competence, and some students were quite limited in their ability to use new technology. The implications of this for researchers and policymakers is to be cautious about generalisations in this field, and to be aware that such ideas may depend on context, and may change over time. The idea of digital natives is discussed in more detail in section 2.2.2.

6.2.6 RELIABILITY

There were a number of contradictions in the data which in itself could call into question the reliability of all of the data collected as part of this study. Miller (1995) notes that one of things people need to do in their interactions with others is present themselves as an acceptable person; in School A this acceptable person could be thought to be someone who uses digital technology in their teaching. It is cautiously theorised that this need to be thought of as a digital technology user could have led teachers in the study to exaggerate their digital technology usage. It may be that lies are more often told to serve the self than to benefit others (Depaulo, et al., 1996, p,980); the self in this instance is served by others believing in an over-inflated description of digital technology use.

The subject of PE provides the strongest evidence of this alleged teacher overstatement of use. The PE teacher recorded using iPads in their teaching for 6.5 hours and interactive whiteboards for 2 hours; the students recorded no use of iPads or interactive whiteboards in their PE lessons. Three students described how: digital technology, “basically every lesson [we use digital technology] apart from, like, one or two if we have tests or PE”; and specifically interactive whiteboards, “[interactive whiteboard] used generally every lesson nine times out of ten, not PE though because you can’t use that”; and iPads, “obviously in PE there’s no technology used, so the iPads can be used outside as well”, were not used in PE lessons. The students’ data directly contradicts the teachers’ data. An alternate view to the teachers exaggerating their usage is that it is the student data which is unreliable. Either way the reliability of the data is questionable and this needs to be considered not only in this research but all research involving teachers and students.

6.2.7 OVERVIEW OF THESIS

The important ideas and key findings emerging from this study are that teachers and students are cautiously positive about their use of digital technology in teaching and learning. However, their actual use is generally confined to the more mundane and less ‘flashy’ elements of the everyday as opposed to the ground-breaking, future changing usage heralded and now expected by the government and technology evangelists. The key applications for teaching and learning were not the most expensive or the most revolutionary but rather the commonplace: data projectors, presentation software and word processors. This study may promote the need for SLT to consider the relatively prosaic issue of the day to day efficiency of digital technology use and support, rather than focusing entirely on 'Blue Skies' thinking. There is clear scope for the further development of digital technology use in schools in order to fully take advantage of all that digital technology is thought to offer.

This study also highlighted the importance of a teachers’ subject when trying to understand the quantity and nature of digital technology that will be used for teaching and learning in the classroom. There are some teachers and some students who did believe that new technology was helpful for improving learning outcomes, but this did not have a 'whole school' or 'transformative' effect. Gains were piecemeal, incremental, fragmented and varied across subjects and even within subject departments. And there were some teachers who were sceptical of some of the claims made for technology integration. The answer to the question, 'Does new technology improve learning outcomes?' from the evidence of this study would appear to be - sometimes - it depends.

6.4 REFLECTIONS ON THE STUDY

This study would have benefited from a lower staff turnover and a higher staff retention. From the start of the data collection portion of the study (a period of just over two years) nine of the twelve teachers had moved to new positions in new schools across Norfolk and two of the three staff had been promoted to new positions within School A. Six of the students had also left; five completed year 11 and one moved to a new school. Lastly, the study would have benefitted from a sample size greater than fifteen teachers and students; a larger sample size, perhaps double the amount that it was would have provided more thick descriptive data to inform the analysis, discussion and conclusion of this study.

An overview of the data obtained from the study suggests that the study elicited more information on some areas compared to others, in terms of the eight questions posed on page 153. For example, whereas the study obtained a reasonable body of quite useful information in respect of research questions 1-7, whereas there was a far smaller volume of information relating to research question 8 ('The extent to which digital technology use helps ‘high order’ thinking'). Within this study, this area remains comparatively unexplored.

This research study lies within a vast body of research on digital technology in education which ranges from: pedagogy for digital technology learning, mobile and tablet technology in the classroom, the persistence of the existence of the digital native, the nature of the digital divide and the impact of digital technology investment. This study has considered some aspects of most of these debates via and in-depth study of teachers’ and students’ perspectives in one school. There are three distinct areas for further research; the first relates to increasing the generalisability of this studies conclusions by applying similar studies to other schools across the UK. This would provide a more forensic view of the tentative conclusions obtained as part of this study. A second area for further investigation may be in relation to the atypical use of iPads in school A. A third area for further research could be in regards to the subject dependent use of digital technology in education.

This investigation increases new knowledge through one single, but in-depth and detailed case study of an inner-city Norfolk school which makes use of diary data collection. There was evidence to suggest that iPad use in School A is quite different to that described in the related literature and previous studies. There were claims by some teachers regarding the importance of the visualiser to their classroom teaching, both in response to its capabilities for whole class teaching and for behaviour management and classroom control. The analysis as part of this study suggests that the most important hardware and software developments for the teachers and students in School A have not been the high-tech expensive technologies but rather the more mundane and every day: data projectors, presentation software, word processors and the world wide web (YouTube). Finally, the importance of a teachers' subject when trying to determine the amount and type of digital technology employed as part of their day to day classroom teaching.

6.4.1 PRESENTATION AND SELF IMPRESSION MANAGEMENT REFLECTIONS AND RECOMMENDATIONS

I would like to conclude this thesis with a reflection on the importance of self-impression management in the field of digital technology integration and development, as this seemed to be a significant outcome of the research, and one which may be of use and relevance to policymakers and other researchers in this field. Goffman (1959) used the theatre metaphor to described the ways through which actors (for example teachers) make identity claims and perform their roles in their daily social interactions (for example in their classrooms). The purpose of such identity work (impression management) is to ensure that a teacher can present and maintain a favourable impression of themselves to those with whom they interact (Drew and Wooton 1998; Manning 1992; Papacharissi, 2002; and Prus 1996). The teachers often have to work to uphold this impression of themselves in their teaching role (Preves & Stephenson, 2009); this impression management may go beyond simply editing of self-presentations to involve lying in order to allow for the fashioning of new and untrue selves (DePaulo, et al., 1996). If it is understood that teachers can and do manipulate the way in which they are perceived by others in order to maintain how they are perceived within their role as a teacher it can be thought that this manipulation may extend to how they are perceived within their role by a researcher. The data collected during research may be an edited version of the truth (or a lie) told to support the impression a teacher is cultivating for themselves or the school.

As part of this investigation there was an element of insider research whereby the data was collected from colleagues working within the same school (School A) as the researcher. In addition, an element of trust sampling was used to select teachers on the basis of their relatively close working relationship with myself as both colleague and researcher. This research may have given rise to a paradox where the teachers are torn between impression management due to the belief that their job is potentially at stake (if management get the wrong impression) and being honest with the “insider”.

A number of the teachers shared feelings and experiences that might throw a negative light on their teaching practice: "It is hard to use interactive whiteboards effectively I feel"; "I feel they are a waste of money"; "I do not feel overly confident with effectively using technology such as iPads and individual laptops in my lessons"; and "I do not exploit the apps available through the iPads". It is difficult to believe that a teacher would be dishonest about seemingly discouraging thoughts and experiences which show their own practise as imperfect. It is more convincing to see these types of comments as honest, as the teachers putting aside impression management in favour of honesty shared with the “trusted insider”. It is pertinent to share at this point that all of these types of comments (highlighting negative practise) were made by teachers who had already secured new jobs at other schools and were leaving at the end of the term. There is some evidence of teachers excusing their perceived shortcomings in regards to digital technology use: "using iPads outside it difficult this time of year [autumn] because of weather but easier in summer”; "we'll be developing ways the students can use it next year"; and "there are some things that I need to look into and obviously improve". This type of comment may indicate feelings of guilt and an acknowledgement that digital technology could be used better. Again, it is difficult to believe that this type of comment would be dishonest because it provides an unfavourable impression of the teacher or there teaching.

The strongest evidence of impression management having occurred is related to contradictions between the students (“obviously in PE there’s no technology used”) and teachers (“[iPad use] five lessons out of ten”). There are many explanations for these differences in experiences, however, one account could be that the teachers have exaggerated their use of digital technology in order to maintain an impression of themselves as digitally competent teachers. There are other instances of teachers ("a thinking skills game using images and dates on the whiteboard” and " show kids a clip") and students ("circles things and he like has a PowerPoint, YouTube clips and stuff") backing up each other’s interpretations. It may be that only some teachers were involved in impression management. Perhaps these teachers felt less close to me as their colleague and researcher and were therefore happier moderating their view of reality in order to maintain my view of them as skilled users of digital technology. An interesting use of the research process by one teacher was as a platform to influence the digital technology policy within School A: "Twitter is great for getting messages out" and "it's a big loss to the department". This manipulation of the research process shows an awareness of the impact of their responses and may to some degree be an example of impression management in itself.

This reflection upon impression management, “insider” research, trust sampling, honesty and the reliability of qualitative data leads to the potentially influential idea of questioning how important data reliability is in qualitative research. It could be said that with data collected via an interview or diary it is less important whether the data collected is truthful or not; but what is more important is that a participant made that claim or statement in the first instance. If a participant is dishonest in their responses, this is just as interesting and relevant to the researcher as if their reply was 100% truthful, honest and accurate.

This study identified small low-cost digital technology shifts which happen every day in real class rooms as opposed to the life changing high-cost transformations predicted and desired by the government and technical evangelists. It is important that school management (SLT), researchers and policy makers have realistic expectations when it comes to promoting the use of digital technology in practice. Teachers are making use of digital technology (for example whiteboard projectors and PowerPoint) on an hourly basis in a way that supports their teaching and their students learning. This use of digital technology though seemingly small is more realistic and sustainable for time-stretched teachers in actual classrooms than ‘holy grail’ solutions (for example interactive whiteboards and over complicated software). We should be supporting pragmatic uses of digital technology in classrooms not forcing new, expensive, flashy, technologies which add nothing to the process of teaching in the name of progress.

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APPENDICES

APPENDIX A: STUDENT LETTER OF CONSENT

Dear Parent/Caregiver,

I am currently completing a Doctorate in Education at UEA. The title of the thesis is 'An Investigation into Digital Technology and a Consideration of Whether it can Enhance Learning: One School's Application of Digital Technology'. To complete this thesis I am conducting a case study into the ways in which digital technology is used in your son's/daughter's lessons.

The focus group I have chosen to conduct this research with are ten students of differing ages and genders. Your son/daughter has been selected to make up part of this group. I want to reassure you that this research will not be a digression from their normal lesson structure.

I propose that all ten students will complete a research diary to record how digital technology is being used in their lessons and its effect on their learning. They will keep a research diary for a week in the autumn term and a week in the spring term. Your son/daughter will then be interviewed in the week following their research diary completion. The purpose of this interview will be to allow your son/daughter to explain their written account and for myself to further understand their views on digital technology.

To ensure that confidentiality is achieved, neither your son's/daughter's name nor the school's name will be identifiable in the written work I submit to the university. Aside from any possible child protection issues or possible issues of serious malpractice from their teachers, your son's/daughter's comments will remain confidential and unidentifiable to colleagues at the school and the university. There will be no negative consequences if you or your son/daughter choose not to participate in the study. Your son/daughter will be given informed consent, that is, the right to withdraw from participating in my investigation at any time he/she chooses. I have expressly asked the school for permission to investigate this, and hopefully my findings will be of use to the school, the students and the teachers.

I look forward to working with your son/daughter and assisting them to consolidate their learning in digital technology through this activity. If you have any concerns or queries about this research please do not hesitate to contact me by email (trudy.coleman@uea.ac.uk). If you have any complaints about the research please contact the Head of School (Education and Lifelong Learning) at UEA, Dr Nalini Boodhoo (n.boodhoo@uea.ac.uk).

Yours Sincerely,

Trudy Coleman
Head of Computing

This consent form establishes that you have read and understood what taking part in this research study will involve. Please tick all boxes that apply.

1. I confirm that I have read and understand the information sheet for the above study and have had the opportunity to ask questions ☐
2. I understand that my son/daughter taking part is optional and that they are free to withdraw at any time, without giving any reason. ☐
3. I understand that any information will only be used anonymously and my son/daughter will not be identified when their views are presented in any publications or reports. ☐
4. I agree for my son/daughter to take part in this study. ☐

Son's/daughter's name___________________________ Name__________________________

Signature_______________________________________ Date ____________________

APPENDIX B: TEACHER LETTER OF CONSENT

Dear Teacher,

I am currently completing a Doctorate in Education at UEA. The title of the thesis is 'An Investigation into Digital Technology and a Consideration of Whether it can Enhance Learning: One School's Application of Digital Technology'. To complete this thesis I am conducting a case study into the ways in which digital technology is used in lessons.

The focus group I have chosen to conduct this research with are ten students and ten teachers (of differing subjects, experiences and pay scales). You have been selected to make up part of this group.

I propose that all participants will complete a research diary to record how digital technology is being used in their lessons and its effect on their teaching. You will keep a research diary for a week in the autumn term and a week in the spring term. You will then be interviewed in the week following the research diary completion. The purpose of this interview will be to allow you to explain your written account and for myself to further understand your views on digital technology.

To ensure that confidentiality is achieved, neither your name nor the school's name will be identifiable in the written work I submit to the university. Your comments will remain confidential and unidentifiable to colleagues at the school or the university. There will be no negative consequences if you choose not to participate in the study. You have informed consent, that is, the right to withdraw from participating in my investigation at any time you choose. I have expressly asked the school for permission to investigate this, and hopefully my findings will be of use to the school, the students and the teachers.

I look forward to working with you and assisting you to consolidate your learning in digital technology through this activity. If you have any concerns or queries about this research please do not hesitate to contact me by email (trudy.coleman@uea.ac.uk). If you have any complaints about the research please contact the Head of School (Education and Lifelong Learning) at UEA, Dr Nalini Boodhoo (n.boodhoo@uea.ac.uk).

Yours Sincerely,

Trudy Coleman
Head of Computing

This consent form establishes that you have read and understood what taking part in this research study will involve. Please tick all boxes that apply.

1. I confirm that I have read and understand the information sheet for the above study and have had the opportunity to ask questions ☐
2. I understand that my taking part is optional and that I am are free to withdraw at any time, without giving any reason. ☐
3. I understand that any information will only be used anonymously and I will not be identified when my views are presented in any publications or reports. ☐
4. I agree for to take part in this study. ☐

Name_______________________________________

Signature_______________________________________ Date ___________________

APPENDIX C: STUDENT & TEACHER DIARY PILOT

Student Diary

Session: _____

Date: _______________

Subject

Monday

List any digital technology used in your lesson	Write how long it was used for	Write what it was used for	Rate how useful it was to your learning 1 – very useful 2 – useful 3 - neither 4 – not useful 5 – not useful at all	Describe how the digital technology affected your learning
White ~~Smart~~ bored	whole lesson	?	3	?
Smartbord ~~Smart bored White~~	Whole lesson			
Smart bord ~~Smart Bord~~	whole lesson			

Please use the space below to describe any feelings you have about digital technology and your learning.

I think that I am happy with my learning and digital technology.

Tuesday

List any digital technology used in your lesson	Write how long it was used for	Write what it was used for	Rate how useful it was to your learning 1 – very useful 2 – useful 3 - neither 4 – not useful 5 – not useful at all	Describe how the digital technology affected your learning
Computer Dt	Whole lesson	Resarch pictors	3	Cause you talk and you dont do any work
Dt computer	Whole lesson	resard pictures	3	
~~com~~				
Computer	30 mins	to make a power point	2	I fa you dont go on what you need

Please use the space below to describe any feelings you have about digital technology and your learning.

learning is ok and digital technology make it better I think.

Wednesday

List any digital technology used in your lesson	Write how long it was used for	Write what it was used for	Rate how useful it was to your learning 1 – very useful 2 – useful 3 - neither 4 – not useful 5 – not useful at all	Describe how the digital technology affected your learning
X				
X				
computers	whole lesson	power point	2	?
X				
X				

Please use the space below to describe any feelings you have about digital technology and your learning.

Learning is ok but digital technology make it much better for every one

Thursday

List any digital technology used in your lesson	Write how long it was used for	Write what it was used for	Rate how useful it was to your learning 1 – very useful 2 – useful 3 - neither 4 – not useful 5 – not useful at all	Describe h… digital techno… affected your le…
~~5c~~				
whit ~~IT~~ bord	Whole lesson	?	3	?
~~whited bored from~~	~~Whole lesson~~			

Please use the space below to describe any feelings you have about digital technology and your learning.

Friday

List any digital technology used in your lesson	Write how long it was used for	Write what it was used for	Rate how useful it was to your learning 1 – very useful 2 – useful 3 - neither 4 – not useful 5 – not useful at all	Describe how the digital technology affected your learning
~~Form~~				

Please use the space below to describe any feelings you have about digital technology and your learning.

Teacher Diary

Session: _____

Date: w/c 10 Nov 2014

Monday

Digital technology used in your lesson	Length of time	Purpose	Rate how useful it was to your teaching 1 – very useful 2 – useful 3 - neither 4 – not useful 5 – not useful at all	Describe how the digital technology affected your teaching

Please use the space below to describe any feelings you have about digital technology and your teaching.

Tuesday

Digital technology used in your lesson	Length of time	Purpose	Rate how useful it was to your teaching 1 – very useful 2 – useful 3 - neither 4 – not useful 5 – not useful at all	Describe how the digital technology affected your teaching
L+T -	60 mins.	Research London Tourism	1	Able to view and relate to subject

Please use the space below to describe any feelings you have about digital technology and your teaching.

Wednesday

Digital technology used in your lesson	Length of time	Purpose	Rate how useful it was to your teaching 1 – very useful 2 – useful 3 - neither 4 – not useful 5 – not useful at all	Describe how the digital technology affected your teaching
PHSE				
PHSE	40 mins.	Power point Lesson Plan	2	Allowed structure to all students

Please use the space below to describe any feelings you have about digital technology and your teaching.

Thursday

Digital technology used in your lesson	Length of time	Purpose	Rate how useful it was to your teaching 1 – very useful 2 – useful 3 - neither 4 – not useful 5 – not useful at all	Describe how the digital technology affected your teaching
PSHE	60 mins	Research benefit values.	1	Students were able to see how much
PSHE	60 mins.	" "	1	they would receive in benefits.

Please use the space below to describe any feelings you have about digital technology and your teaching.

It would have been much slower and less engaged if this information had to be gleaned from a text book.
Also, it would not have been up to date if in a book.

Friday

Digital technology used in your lesson	Length of time	Purpose	Rate how useful it was to your teaching 1 – very useful 2 – useful 3 - neither 4 – not useful 5 – not useful at all	Describe how the digital technology affected your teaching
Business –	60 mins.	How a Limited Company works.	1	Students finding out.

Please use the space below to describe any feelings you have about digital technology and your teaching.

All students engaged in findings for how at LTD company works. Information needed about Share capital, share holders, FTSE, directors and Bankruptcy.

APPENDIX D: STUDENT & TEACHER DIARY

Student Diary

Session: ______

Date: ________________

Monday

Subject	List any digital technology used in your lesson	Write how long it was used for	Write what it was used for	Rate how useful it was to your learning 1 – very useful 2 – useful 3 - neither 4 – not useful 5 – not useful at all	Describe how the digital technology affected your learning

Please use the space below to describe any feelings you have about digital technology and your learning.

Tuesday

Subject	List any digital technology used in your lesson	Write how long it was used for	Write what it was used for	Rate how useful it was to your learning 1 – very useful 2 – useful 3 - neither 4 – not useful 5 – not useful at all	Describe how the digital technology affected your learning

Please use the space below to describe any feelings you have about digital technology and your learning.

Wednesday

Subject	List any digital technology used in your lesson	Write how long it was used for	Write what it was used for	Rate how useful it was to your learning 1 – very useful 2 – useful 3 - neither 4 – not useful 5 – not useful at all	Describe how the digital technology affected your learning

Please use the space below to describe any feelings you have about digital technology and your learning.

Thursday

Subject	List any digital technology used in your lesson	Write how long it was used for	Write what it was used for	Rate how useful it was to your learning 1 – very useful 2 – useful 3 - neither 4 – not useful 5 – not useful at all	Describe how the digital technology affected your learning

Please use the space below to describe any feelings you have about digital technology and your learning.

Friday

Subject	List any digital technology used in your lesson	Write how long it was used for	Write what it was used for	Rate how useful it was to your learning 1 – very useful 2 – useful 3 - neither 4 – not useful 5 – not useful at all	Describe how the digital technology affected your learning

Please use the space below to describe any feelings you have about digital technology and your learning.

Teacher Diary

Subject: ________________

Session: _____

Date: _______________

Monday

Digital technology used in your lesson	Length of time	Purpose	Rate how useful it was to your teaching 1 – very useful 2 – useful 3 - neither 4 – not useful 5 – not useful at all	Describe how the digital technology affected your teaching

Please use the space below to describe any feelings you have about digital technology and your teaching.

Tuesday

Digital technology used in your lesson	Length of time	Purpose	Rate how useful it was to your teaching 1 – very useful 2 – useful 3 - neither 4 – not useful 5 – not useful at all	Describe how the digital technology affected your teaching

Please use the space below to describe any feelings you have about digital technology and your teaching.

Wednesday

Digital technology used in your lesson	Length of time	Purpose	Rate how useful it was to your teaching 1 – very useful 2 – useful 3 - neither 4 – not useful 5 – not useful at all	Describe how the digital technology affected your teaching

Please use the space below to describe any feelings you have about digital technology and your teaching.

Thursday

Digital technology used in your lesson	Length of time	Purpose	Rate how useful it was to your teaching 1 – very useful 2 - useful 3 - neither 4 – not useful 5 – not useful at all	Describe how the digital technology affected your teaching

Please use the space below to describe any feelings you have about digital technology and your teaching.

Friday

Digital technology used in your lesson	Length of time	Purpose	Rate how useful it was to your teaching 1 – very useful 2 – useful 3 - neither 4 – not useful 5 – not useful at all	Describe how the digital technology affected your teaching

Please use the space below to describe any feelings you have about digital technology and your teaching.

APPENDIX E: STUDENT & TEACHER INTERVIEW PROMPTS PILOT

Semi-structured Interview Question Prompts - Teachers

- How confident are you with using digital technology in your lessons?
- How confident are your students' with using digital technology?
- Truthfully how often do you use digital technology in your lessons?
- When you use digital technology in your lessons do you think it is effective in regards to your teaching?
- How about for learning?
- Do your students like using digital technology?
- Does digital technology engage your students?
- Does digital technology drive student progress in your lessons?
- Does digital technology drive student achievement in your lessons?
- Does digital technology encourage deep independent learning?

Semi-structured Interview Question Prompts - Students

- How confident are you with using digital technology?
- How confident are your teachers' with using digital technology?
- How often do your teachers use digital technology in your lessons?
- How often do you use digital technology outside of lessons for education purposes?
- When digital technology is used in your lessons do you think it is effective in regards to teaching?
- How about for learning?
- Do you like using digital technology?
- Does digital technology engage you?
- Does digital technology increase your progress?
- Does digital technology make your achievement better?
- Does digital technology encourage deep independent learning?

APPENDIX F: STUDENT & TEACHER INTERVIEW PROMPTS

Semi-structured Interview Question Prompts - Students

- **Use examples to describe your top three digital technologies for learning.**

  Prompts: What marks would you give them out of 5 (5 - couldn't teach without it/1 – not useful to my teaching)? How often per week do you use them? What digital technology is available to you? How do you use it? What are your 3 least favourite? Why?

- **Do you feel that you use enough digital technology in your learning?**

  Prompts: How many hours over a week are spent learning with the aid of digital technology? Would you like to use more? What are the reasons for digital technology not being used? Give an example of when digital technology has not worked in your teaching.

- **Do you think digital technology makes learning better?**

  Prompts: Give an example of when digital technology has helped you to make progress? Give an example of when digital technology has helped to raise your achievement? Give an example of when digital technology has encouraged deep independent learning? Do your like using digital technology? Why? Does digital technology engage you? Why?

- **How confident are you with using digital technology in your lessons?**

  Prompts: Do you feel your teachers are more or less confident than you? How could you improve your confidence?

- **Give examples of how you use digital technology outside of lessons for education purposes?**

  Prompts: How often do you use digital technology outside of your lessons? Do you use digital technology for homework? Do you use digital technology for learning without being encouraged by your teachers?

- **Do you feel pressure to learn using digital technology?**

  Prompts: Who is this pressure from? How does this pressure affect you? Do you think there is a difference between the amount of digital technology used in your learning and the amount that is reported as being used? Why?

- **In what ways does the Internet make it easier for you to learn effectively?**

  Prompts: In what ways do you make use of it in your learning while at school? In what ways do you make use of it in your learning whilst outside of lessons?

Semi-structured Interview Question Prompts - Teachers

- **Use examples to describe your top three digital technologies for teaching.**

  Prompts: What marks would you give them out of 5 (5 - couldn't teach without it/1 – not useful to my teaching)? How often per week do you use them? What digital technology is available to you? How do you use it? What are your 3 least favourite? Why?

- **Do you feel that you use enough digital technology in your teaching?**

  Prompts: How many hours over a week are spent teaching with the aid of digital technology? Would you like to use more? What are your reasons for not using digital technology? Give an example of when digital technology has not worked in your teaching.

- **Do you think digital technology is effective for teaching?**

  Prompts: Give an example of when digital technology has driven student progress in your lessons? Give an example of when digital technology has driven student achievement in your lessons? Give an example of when digital technology has encouraged deep independent learning? Do your students like using digital technology? Why do you think this? Does digital technology engage your students? Why do you think this?

- **How confident are you with using digital technology in your lessons?**

  Prompts: Do you feel your students are more or less confident than you? How could you improve your confidence?

- **Do you feel pressure to use digital technology in your teaching?**

  Prompts: Who is this pressure from? How does this pressure affect you? Is there a difference between the amount of digital technology you use in your teaching and the amount you would feel comfortable reporting to other teachers/SLT/governors/parents/students? Why? Do you feel supported? Would you feel comfortable asking for training?

- **In what ways does the Internet make it easier for you to teach effectively?**

  Prompts: In what ways do you make use of it in your classroom teaching? In what ways do you make use of it outside your classroom?

APPENDIX G: TEACHER DIARY SAMPLE

Student Diary –

Session: Autumn

Date: 15th-19th December

Monday

Subject	List any digital technology used in your lesson	Write how long it was used for	Write what it was used for	Rate how useful it was to your learning 1 – very useful 2 – useful 3 - neither 4 – not useful 5 – not useful at all	Describe how the digital technology affected your learning
Computing	Laptops	45 minutes	To investigate commands in terminal	Very Useful	Helped me understand the program more.

Please use the space below to describe any feelings you have about digital technology and your learning.

Tuesday

Subject	List any digital technology used in your lesson	Write how long it was used for	Write what it was used for	Rate how useful it was to your learning 1 – very useful 2 – useful 3 - neither 4 – not useful 5 – not useful at all	Describe how the digital technology affected your learning
Science	Laptops	30minutes	Investigate rate of reactions	useful	Helped me secure my knowledge
Geography	Laptops	1 hour	Investigate biomes	Very useful	"
English	Ipads	10 minutes	Look at popular authors/ favourite books	neither	It was (11) interesting (12) research

Please use the space below to describe any feelings you have about digital technology and your learning.

Wednesday

Subject	List any digital technology used in your lesson	Write how long it was used for	Write what it was used for	Rate how useful it was to your learning 1 – very useful 2 – useful 3 – neither 4 – not useful 5 – not useful at all	Describe how the digital technology affected your learning
Computing	Laptops	30minutes	Decoding a terminal code.	Very useful	Helped me understand the key terms
Science	Laptops	90minutes	Revision Session	Very Useful	Helped me understand more topics

17

Please use the space below to describe any feelings you have about digital technology and your learning.

Thursday

Subject	List any digital technology used in your lesson	Write how long it was used for	Write what it was used for	Rate how useful it was to your learning 1 – very useful 2 – useful 3 – neither 4 – not useful 5 – not useful at all	Describe how the digital technology affected your learning
Computing	Laptops	45minutes	To make a revision Calendar	useful	Helped me make revision sources.
Electronics	Laptops	30minutes	Find information about an integrared chip.	useful	Expanded my knowledge.

Please use the space below to describe any feelings you have about digital technology and your learning.

Friday

Subject	List any digital technology used in your lesson	Write how long it was used for	Write what it was used for	Rate how useful it was to your learning 1 – very useful 2 – useful 3 - neither 4 – not useful 5 – not useful at all	Describe how the digital technology affected your learning

Please use the space below to describe any feelings you have about digital technology and your learning.

Student Diary

Session: 16th - 20th March 2015

Date: ↑ Spring

Monday

Subject	List any digital technology used in your lesson	Write how long it was used for	Write what it was used for	Rate how useful it was to your learning 1 – very useful 2 – useful 3 - neither 4 – not useful 5 – not useful at all	Describe how the digital technology affected your learning

Please use the space below to describe any feelings you have about digital technology and your learning.

* No digital technology was used in my lessons on this day.

Tuesday

Subject	List any digital technology used in your lesson	Write how long it was used for	Write what it was used for	Rate how useful it was to your learning 1 – very useful 2 – useful 3 - neither 4 – not useful 5 – not useful at all	Describe how the digital technology affected your learning
Electronics Science	Laptops Ipads	30 minutes	Research for a presentation	1	It helped me gain more knowledge.
	Laptops	1 hour	Research for coursework	1	It helped me with completing tasks.

Please use the space below to describe any feelings you have about digital technology and your learning.

Wednesday

Subject	List any digital technology used in your lesson	Write how long it was used for	Write what it was used for	Rate how useful it was to your learning 1 – very useful 2 – useful 3 - neither 4 – not useful 5 – not useful at all	Describe how the digital technology affected your learning
Computing	Apple Macs	45 minutes	Completing Course-work	1	It helped me a Lot.
Science	Laptops Ipads *	1 hour	Research for a presentation /poster	1	It helped me gain extra knowledge.

Please use the space below to describe any feelings you have about digital technology and your learning.

*In this lesson we were also allowed to use our mobile phones for research - therefore I used my Iphone aswell.

Thursday

Subject	List any digital technology used in your lesson	Write how long it was used for	Write what it was used for	Rate how useful it was to your learning 1 – very useful 2 – useful 3 - neither 4 – not useful 5 – not useful at all	Describe how the digital technology affected your learning
Humanities	Interactive Whiteboard	15 minutes	Completing a quiz	2	It contained lots of information
Computing	Apple Macs	1 hour	Completing coursework	1	It helped me a lot.
Electronics	Laptops	1 hour	Research for a product	1	It helped me improve my work.

Please use the space below to describe any feelings you have about digital technology and your learning.

Friday

Subject	List any digital technology used in your lesson	Write how long it was used for	Write what it was used for	Rate how useful it was to your learning 1 – very useful 2 – useful 3 – neither 4 – not useful 5 – not useful at all	Describe how the digital technology affected your learning
Science	Ipads Iphones	30 minutes	Researching for a project	1	It gave me lots of information
Geography	Laptops	20 minutes	Completing a case Study	1	It helped me complete my work.

Please use the space below to describe any feelings you have about digital technology and your learning.

• Overall I use digital technology regularly in my lessons, and I think that it benefits myself and other students massively.
It allows us to find lots of useful information easily, 17 and it gives students many more ways to learn 17 5 and in a 11 12 13 more fun way too.
It helps us connect with the whole 2 world and I think that using this technology helps to improve learning. 1 14

Autumn

Student Diary

Session: Computing

Date: Tuesday 10th February

Monday I was ill

Subject	List any digital technology used in your lesson	Write how long it was used for	Write what it was used for	Rate how useful it was to your learning 1 – very useful 2 – useful 3 - neither 4 – not useful 5 – not useful at all	Describe how the digital technology affected your learning

Please use the space below to describe any feelings you have about digital technology and your learning.

Tuesday

Subject	List any digital technology used in your lesson	Write how long it was used for	Write what it was used for	Rate how useful it was to your learning 1 – very useful 2 – useful 3 - neither 4 – not useful 5 – not useful at all	Describe how the digital technology affected your learning
Music	•keyboards •Headphones •~~Edm~~ Computers	Most of lesson	Makeing music on garage band and using Edmodo	1	It was good to use the technology to discuss on Edmodo
French	•white board	End of lesson	listening to french song	3	We only listened twice so we didn't learn it very well
Maths	•white board •calculators	Most of Lesson	Used to calculate sums, that were difficult	1	I helped a lot and we didn't just use it so it's a good balance
computing	•computers •whiteboard	•All lesson	Used for making games on scratch	1	It was really fun to make so it was useful
English	•None	•Blank	•Blank	3	It was good to just read

Please use the space below to describe any feelings you have about digital technology and your learning.

16 Sometimes technology can be so overbearing in lessons, so much so I sometimes get a head-ache! So I beleive its good to have a balance between both.

Wednesday

Subject	List any digital technology used in your lesson	Write how long it was used for	Write what it was used for	Rate how useful it was to your learning 1 – very useful 2 – useful 3 – neither 4 – not useful 5 – not useful at all	Describe how the digital technology affected your learning
DT (good)	• whiteboard • ovens (is that counts?)	• whiteboard was start and end • ovens: most of lesson	Cooking and looking at advice on board	1	ovens are essential to cooking. If they weren't used we could get salmon
Drama	• laptop	Most of lesson	Teacher used it so not sure.	2	It was ok having not much technology
Geography	~~None~~ • Phones	~~• Blank~~ Some of lesson	• ~~Blank~~ Listening to music while we worked	3	It was nice to be able to listen but I don't have a phone so didn't effect me.
Maths	• None I remember	• Not sure	• Again, not sure	3	I wasn't concious of using any so not effected.

Please use the space below to describe any feelings you have about digital technology and your learning.

Today was a little bare when it come to technology (either that or I really need to get a phone)

But joking aside, I can't seem to remember any technology in maths. However as I have said on blank days, I have been rather ill recently so I probably didn't notice any.

Thursday I was ill

Subject	List any digital technology used in your lesson	Write how long it was used for	Write what it was used for	Rate how useful it was to your learning 1 – very useful 2 – useful 3 - neither 4 – not useful 5 – not useful at all	Describe how the digital technology affected your learning

Please use the space below to describe any feelings you have about digital technology and your learning.

Friday

Subject	List any digital technology used in your lesson	Write how long it was used for	Write what it was used for	Rate how useful it was to your learning 1 – very useful 2 – useful 3 - neither 4 – not useful 5 – not useful at all	Describe how the digital technology affected your learning
French	• None	• Blank	• Blank	3	We where doing a test so we didn't need it.
PSHE	• whiteboard • Macs	We where planning a trip out and we needed the computers.	most of the lesson	1	It would have been really hard to calculate the prise without the computer
English	• None	• Blank	• Blank	3	we where reading aloud in class so it was nice
~~Sience~~ Sience	• whiteboard	• start of Lesson	so we could do the starter	2	It was only used a bit

Please use the space below to describe any feelings you have about digital technology and your learning.

Strangely, I'm happy with the lack of technology today. Sometimes its good to have lots of technology but I 16 prefere the balanced use.

In conclusion, I think that the level of technology in CAN is perfect as it is!

Spring

Student Diary

Session: _____

Date: _______________

Monday
~~Tuesday~~

Subject	List any digital technology used in your lesson	Write how long it was used for	Write what it was used for	Rate how useful it was to your learning 1 – very useful 2 – useful 3 - neither 4 – not useful 5 – not useful at all	Describe how the digital technology affected your learning
Science	• None	• Blank	• Blank	4	We where just doing a written test So none was used.
Maths	• whiteboard	Most of the lesson	To present the questions we needed to do	2	It was relatively useful so we could see the questions.
PE	None	Blank	Blank	4	Same as science none was used but we did activities instead
PSHE	• Whiteboard	• All of lesson	we where looking at a presentation.	1	It was very good to watch and understand it.
English	• whiteboard	• Most of lesson	to watch clips of Harry Potter	2	I didn't like it much but I don't like Harry Potter so you get the idea.

Please use the space below to describe any feelings you have about digital technology and your learning.

16

Sometimes, its good to have a break and just do activities so the balance today was good.

~~Monday~~ Tuesday

Subject	List any digital technology used in your lesson	Write how long it was used for	Write what it was used for	Rate how useful it was to your learning 1 – very useful 2 – useful 3 - neither 4 – not useful 5 – not useful at all	Describe how the digital technology affected your learning
Music	• Keyboards • Macs • Garage band	All of lesson	Composing blues music	1	It's great to compose on garage band,
~~Art~~ French	• None	• Blank	• Blank	4	I honestly can't remember what happend then.
Maths	• whiteboard	Most of lesson	• watching a presentation	3	It didn't really impress me; its just like every other day.
Computing	• macbooks • Scratch	• All lesson	• making games	1 (11)	I LOVE computing (compliment) because we do fun things on the computer
English	• Whiteboards	• Most of lesson	• watching presentation on Harry Potter... again.	2	It was ok but not great.

Please use the space below to describe any feelings you have about digital technology and your learning.

Sorry I got the days the wrong way round. Anyway, I think the tech is more frequent than Monday but its usually used (5) in a creative way. So, I don't mind it so much.

Wednesday

Subject	List any digital technology used in your lesson	Write how long it was used for	Write what it was used for	Rate how useful it was to your learning 1 – very useful 2 – useful 3 - neither 4 – not useful 5 – not useful at all	Describe how the digital technology affected your learning
DT	•Resistors •LEDs •PCB card •Solar panel etc.	All of Lesson	Making a circuit board for solar garden light.	1	It was essential to have the tech to make it so it was pretty important!
Drama	•Macbooks	Most of Lesson	Doing more presentations.	2	We couldn't access our previous slides but they were useful anyway
Geography	•computers •Headphones	All of Lesson	making presentations	1	We used the headphones to listen to music whilst working
Maths	•white boards •Calculators	Most of Lesson	Watching maths presentation	3	It was just like every other day so it was unnesseseary.

Please use the space below to describe any feelings you have about digital technology and your learning.

Lots of technology today, only maths is bothering me.
3 We always use the same kind of technology in it and its frustrating. 16

Thursday

Subject	List any digital technology used in your lesson	Write how long it was used for	Write what it was used for	Rate how useful it was to your learning 1 – very useful 2 – useful 3 - neither 4 – not useful 5 – not useful at all	Describe how the digital technology affected your learning
Science	~~None~~ • whiteboard	• Most of lesson	checking marking	2	we where marking tests so it was useful.
History	• whiteboard	Most of Lesson	watching presentation on crusades.	1	It helped push along the lesson so we made progress.
English	• whiteboard	• some of lesson	presentation	3	It was the same old deal.
Art	• Photocopier	• Most of lesson	copying our portraits	1	It was very useful so we could make our poster.
PE	• None	• Blank	Blank	3 or 2	It was good to just have activities.

Please use the space below to describe any feelings you have about digital technology and your learning.

3

I think a recurring theme is appearing: The same, boring use for technology. Maybe we need to make technology more exciting more of the time.

Friday

Subject	List any digital technology used in your lesson	Write how long it was used for	Write what it was used for	Rate how useful it was to your learning 1 – very useful 2 – useful 3 – neither 4 – not useful 5 – not useful at all	Describe how the digital technology affected your learning
~~[illegible]~~ French	•None	Blank	Blank	3 or 2	We were preparing for speaking test so no need for tech.
PSHE	•whiteboard	Most of Lesson	Watching Presentation on divorce	2	we discussed divorse and did a poem so there was a good balance in technology
English	None I can remember	Blank	Don't remember	3	I honestly don't remember what happened in English sorry.
Science	•whiteboard	Some sections of lessons	To do theory on waves.	2	It was useful to do the theory in between the activities.
Maths	•whiteboard	Presenting starter ect.	most of Lesson	3	It's just a boring way of learning which is a shame.

Please use the space below to describe any feelings you have about digital technology and your learning.

Again, there is this repeating pattern. And the technology was low today too.

Student Diary

Session: Autumn

Date: ______________

Monday

Subject	List any digital technology used in your lesson	Write how long it was used for	Write what it was used for	Rate how useful it was to your learning 1 – very useful 2 – useful 3 - neither 4 – not useful 5 – not useful at all	Describe how the digital technology affected your learning
maths	smart board	all lesson	teacher done workings out etc.	1	made it easier
English	smart board	all lesson	teacher shew things we had to do	2	made it a bit easier/helpful
french	smart board	all lesson	teacher shew things we had to do	2	bit more easier/helpful
pshe	smart board, laptops, own devices	all lesson	research	1	a lot easier/helpful
science	smart board, laptops	all lesson	teacher shew things we had to do	1	made it easier/helpful

Please use the space below to describe any feelings you have about digital technology and your learning.

3 - We use ipad/laptops etc very rarely so we could use them more often.

Tuesday

Subject	List any digital technology used in your lesson	Write how long it was used for	Write what it was used for	Rate how useful it was to your learning 1 – very useful 2 – useful 3 - neither 4 – not useful 5 – not useful at all	Describe how the digital technology affected your learning
maths	Smart board	all lesson	teacher shew things we had to do	2	made it easier 17
Science	smart board	all lesson	teacher shew things we had to do	2	made it easier
DT	smart board	all lesson	teacher shew things we had to do	1	made it easier
Photography	smart board	all lesson	teacher shew us things we had to do	2	made it easier
P.E	none	X	X	X	X

Please use the space below to describe any feelings you have about digital technology and your learning.

3 - We could use more technology during lessons.

Wednesday

Subject	List any digital technology used in your lesson	Write how long it was used for	Write what it was used for	Rate how useful it was to your learning 1 – very useful 2 – useful 3 – neither 4 – not useful 5 – not useful at all	Describe how the digital technology affected your learning
photography	smart board	all lesson	to show what we had to do	2	helpful
English	smart board	all lesson	to show things we had to do	2	helpful
maths	smart board	all lesson	to show things we had to do	2	helpful
French	smart board	all lesson	to show what we had to do	2	helpful
Spanish	smart board	all lesson	to show what we had to do	2	helpful
science	smart board	all lesson	to show what we had to do.	2	helpful

Please use the space below to describe any feelings you have about digital technology and your learning.

use more technology in lessons.

Thursday

Subject	List any digital technology used in your lesson	Write how long it was used for	Write what it was used for	Rate how useful it was to your learning 1 – very useful 2 – useful 3 - neither 4 – not useful 5 – not useful at all	Describe how the digital technology affected your learning
maths	Smart board	all lesson	to show us what we had to do	2	helpful
Science	Smart board	all lesson	to show what we had to do	2	helpful
DT	Smart board	all lesson	to show what we had to do	2	helpful
English	Smart board	all lesson	to show what we had to do.	2	helpful
History	smart board	all lesson	to show what we had to do.	2	helpful

Please use the space below to describe any feelings you have about digital technology and your learning.

Use more technology in lessons.

Friday

Subject	List any digital technology used in your lesson	Write how long it was used for	Write what it was used for	Rate how useful it was to your learning 1 – very useful 2 – useful 3 – neither 4 – not useful 5 – not useful at all	Describe how the digital technology affected your learning
science	Smart board	all lesson	to shew what we had to do	2	helpful
geography	Smart board	all lesson	to show what we had to do	2	helpful
English	smart board	all lesson	to show what we had to do	2	helpful
spanish	Smart board	all lesson	to show what we had to do	2	helpful
RE	smart board	all lesson	to show what we had to do	2	helpful
photography	Smart board/ mac book	all lesson.	to show what we had to do/ for iphoto	1	helpful

Please use the space below to describe any feelings you have about digital technology and your learning.

Use more technology in lessons.

Student Diary

Session: Spring

Date: ______________

Monday

Subject	List any digital technology used in your lesson	Write how long it was used for	Write what it was used for	Rate how useful it was to your learning 1 – very useful 2 – useful 3 – neither 4 – not useful 5 – not useful at all	Describe how the digital technology affected your learning
Maths	smart board	all lesson	to show things we had to do	2-1	helped me under-stand
English	smart board	all lesson	to show things we had to do	2-1	helped me under-stand
French / PSHE	smart board	all lesson	to show things we had to do	2-1	helped me under-stand
French	smart board	all lesson	to show things we had to do	2-1	helped me under-stand
Science	smart board	all lesson	to show things we had to do	2-1	helped me under-stand

Please use the space below to describe any feelings you have about digital technology and your learning.

Tuesday

Subject	List any digital technology used in your lesson	Write how long it was used for	Write what it was used for	Rate how useful it was to your learning 1 – very useful 2 – useful 3 - neither 4 – not useful 5 – not useful at all	Describe how the digital technology affected your learning
Maths	Smart board	all lesson	to show things we had to do	2 - 1	helped/made it easier to understand
Science	Smart board	all lesson	to show things we had to do	2 - 1	made it easier to underst-and
D.T	N/A	N/A	N/A	N/A	N/A
Art	N/A	N/A	N/A	N/A	N/A
P.E	N/A	N/A	N/A	N/A	N/A

Please use the space below to describe any feelings you have about digital technology and your learning.

Wednesday

Subject	List any digital technology used in your lesson	Write how long it was used for	Write what it was used for	Rate how useful it was to your learning 1 – very useful 2 – useful 3 - neither 4 – not useful 5 – not useful at all	Describe how the digital technology affected your learning
Art	N/A	N/A	N/A	N/A	N/A
English	smart board	most of the lesson	show what we had to do	2-1	easier to understand
maths/french	smart board	most of the lesson	show what we had to do	2-1	easier to under-stand
spanish	N/A	N/A	N/A	N/A	N/A
science	smart board	all lesson	show what we had to do	2-1	easier to under-stand

Please use the space below to describe any feelings you have about digital technology and your learning.

Thursday

Subject	List any digital technology used in your lesson	Write how long it was used for	Write what it was used for	Rate how useful it was to your learning 1 – very useful 2 – useful 3 - neither 4 – not useful 5 – not useful at all	Describe how the digital technology affected your learning
maths	smart board	all lesson	show what we had to do	2-1	easier to under-stand
science	smart board	all lesson	show what we had to do	2-1	easier to understand
D.T	laptops / smart board	all lesson	show what we had to do + work	2-1	easier to under-stand
English	Smart board	all lesson	Show what we had to do	2-1	easier to under-stand
History	Smart board	all lesson	Show what we had to do	2-1	easier to under-stand.

Please use the space below to describe any feelings you have about digital technology and your learning.

Friday

Subject	List any digital technology used in your lesson	Write how long it was used for	Write what it was used for	Rate how useful it was to your learning 1 – very useful 2 – useful 3 - neither 4 – not useful 5 – not useful at all	Describe how the digital technology affected your learning
science	Smart board / own devices	all lesson	research + show what we had to do	work 1	made it easier
geography	laptops	all lesson	research / work	1	made it easier
English / Spanish	N/A	N/A	N/A	N/A	N/A
R.E	Smart board	all lesson	show what we had to do	2-1	made it easier
Art	N/A	N/A	N/A	N/A	N/A

17

Please use the space below to describe any feelings you have about digital technology and your learning.

APPENDIX H: STUDENT DIARY SAMPLE

Teacher Diary

Subject: History

Session: Autumn

Date: 02/12/14

Monday

Digital technology used in your lesson	Length of time	Purpose	Rate how useful it was to your teaching 1 – very useful 2 – useful 3 - neither 4 – not useful 5 – not useful at all	Describe how the digital technology affected your teaching
Interactive whiteboard use	1 hour	Display images and tasks students complete in lesson information	2 Useful	In History we use power points interactively with the students- starter activities, quizzes Enables instructions to always visible to reduce time explaining tasks repeatedly
Sound clip	5 minutes	For students to listen to and analyse an historical speech	2 useful	Impact learning- this short clip focused students on listening and thinking- helped support the point I was making in a powerful way
Interactive whiteboard	20 minutes	Display map of medieval Norwich and students work out who lived where	2 useful	Helped display map of medieval Norwich- students used whiteboard interactively to label the map This saved the photocopying of 30 maps when using the whiteboard together as a map
BBC video class clip	6 minutes	Show how the First World War ended		Short video clips when used for a purpose can create impact learning in a subject like History

Please use the space below to describe any feelings you have about digital technology and your teaching.

Digital technology has the power to open up a subject like History. With so much History on the internet and through you tube powerful clips and images can be used to put across the past in different ways. Digital technology has to be thought about and considered. It can create 'lazy' teaching and teachers. Digital technology must be used purposefully in lessons to improve the quality of teaching. It cannot be used as an excuse to reduce the time and thought that goes into planning lessons

Tuesday

Digital technology used in your lesson	Length of time	Purpose	Rate how useful it was to your teaching 1 – very useful 2 – useful 3 - neither 4 – not useful 5 – not useful at all	Describe how the digital technology affected your teaching
Interactive whiteboard	20 minutes	Display images of life in a workhouse	2	Enabled students to visualise what a work house was like- helped me focus my explanations of workhouse life
Power point	10 minutes	Quiz style 'blockbusters' quiz assessing students prior learning	1 12	Opportunity for me in a more engaging way to assess prior learning and introduce the start of the lesson
You tube	15 minutes	Show opening part of Oliver Twist- students made notes on life inside a work house	2 12	Engaged students by watching the video clip- gave them a focus and was a different way of introducing life in a work house
Video clip	5 minutes	Showed protest marches In America towards the Vietnam war	1 12	Helped students visualise the protest movement- enabled me to introduce the protest movement in a more engaging way

Please use the space below to describe any feelings you have about digital technology and your teaching.

1 5 9

The opportunity to use you tube has enabled a wealth of video clips and digital resources to be used within lessons. It has enabled me show short, powerful clips that help illustrate a point and create more of an impact when introducing and trying to open up topics 12

Wednesday

Digital technology used in your lesson	Length of time	Purpose	Rate how useful it was to your teaching 1 – very useful 2 – useful 3 - neither 4 – not useful 5 – not useful at all	Describe how the digital technology affected your teaching
Power point	1 hour	This enabled me to create a structured revision lesson for year 10 before exam week-enabled display of exam questions and material	2	Using the power point to display exam papers and questions provides visual stimulus for students especially as the lesson involved a lot of me talking 9
Power point	10 minutes	Quiz style 'blockbusters' quiz assessing students prior learning	1	Opportunity for me in a more engaging way to assess prior learning and introduce the start of the lesson
You tube	15 minutes	Show opening part of Oliver Twist-students made notes on life inside a work house	2	Engaged students by watching the video clip-gave them a focus and was a different way of introducing life in a work house
Interactive whiteboard	20 minutes	Display map of medieval Norwich and students work out who lived where	2 useful	Helped display map of medieval Norwich-students used whiteboard interactively to label the map This saved the photocopying of 30 maps when using the whiteboard together as a map

Please use the space below to describe any feelings you have about digital technology and your teaching.

9 In my room I have a trolley of 30 i-pads. I only use them for students when carrying out research. I'd like to find out more creative ways of using the i-pads as I feel they are a bit of a waste of money. 7 4

Thursday

Digital technology used in your lesson	Length of time	Purpose	Rate how useful it was to your teaching 1 - very useful 2 - useful 3 - neither 4 - not useful 5 - not useful at all	Describe how the digital technology affected your teaching
Interactive whiteboard	20 mins	Display a board game exploring the life of a medieval peasant	2	This enabled me to visually explain how the board game worked and explain the instructions to each student helping me to explain each task more clearly
Interactive whiteboard	20 mins	Display an exam paper	3	Displaying an exam paper. Helped me go through the paper with students and highlight key questions and words 9
BBC class clips	10 minutes	Get students to think about how the First World War ended	2	This proved a useful starter activity getting students to think about how the First World War ended and the impact of the war. Video clip generated discussion and ideas
You tube	15 minutes	To show students a speech by Martin Luther King on the Vietnam War	2	Students asked to close their eyes and listen carefully to the meaning of the words. This helped to create more impact.

Please use the space below to describe any feelings you have about digital technology and your teaching.

I don't think teachers should be afraid to use the students digital technology skills within lessons. I am not a digital teacher. I know the basics. If students within my lessons are engaged with digital technology I need to look for more ways to engage the students within my lessons using digital technology 7 4

Friday

Digital technology used in your lesson	Length of time	Purpose	Rate how useful it was to your teaching 1 – very useful 2 – useful 3 - neither 4 – not useful 5 – not useful at all	Describe how the digital technology affected your teaching
BBC class clips	5 minutes	To show students examples of the type of work students did during the Industrial Revolution	2	After showing students images of children working in factories and jobs this short video clip helped to bring these jobs to life
I pads	30 minutes	The purpose was to allow the students to conduct their own research into the protest movement towards the Vietnam War	2	Students were given 2 directed websites to use and focus their reading. It gave them the opportunity to carry out independent research and take more ownership of their learning S
You tube	15 minutes	Show opening part of Oliver Twist- students made notes on life inside a work house	2	Engaged students by watching the video clip- gave them a focus and was a different way of introducing life in a work house

Please use the space below to describe any feelings you have about digital technology and your teaching.

Teacher Diary

Subject: History

Session: Spring

Date: 27/04/15

Monday

Digital technology used in your lesson	Length of time	Purpose	Rate how useful it was to your teaching 1 – very useful 2 – useful 3 - neither 4 – not useful 5 – not useful at all	Describe how the digital technology affected your teaching
Use of whiteboard to show images of slavery during teaching of the slave trade topic	15 minutes	To bring to life what happened to slaves during the slave trade	2	I was able to use the images to help shape my explanation of slavery while students had a visual image to support my explanation of the capture of slaves
Video clip on surgery	20 minutes	Teaching tool on surgery	2	It helped students see how surgery was carried out as part of their surgery unit
Turning points of World War Two thinking skills activity	10 minutes	To get the pupils thinking and recapping on the key turning points of World War Two	1 9 5	It was thinking skills game using images and dates on the whiteboard. Students had to match up the correct turning points with the correct dates
Video clip	20 minutes	Students watched a recreation of the Battle of Stalingrad	2 9 5	Students completed a question sheet while watching the video

Please use the space below to describe any feelings you have about digital technology and your teaching.

9 3 It is hard to use interactive whiteboards effectively I feel. I tend to use power points
5 in a more creative way than using the interactive whiteboard. I feel they often prove
10 nothing more useful than a display board

Tuesday

Digital technology used in your lesson	Length of time	Purpose	Rate how useful it was to your teaching 1 – very useful 2 – useful 3 - neither 4 – not useful 5 – not useful at all	Describe how the digital technology affected your teaching
Thinking skills jigsaw activity	15 minutes	To get the students thinking why an NHS was set up	1	It got the students discussing, piecing information together 17 13 12
Timer	30	To time the year 7 students as they completed their year 7 assessment	3 6	It was a visual reminder for students of how long they had left to complete their assessment
Video	30	Students watched a video on the last days in the life of Hitler	2	Students completed a question sheet. Whiteboard used a big screen to show the programme
Display model answers	30	To display mark schemes and model answers as the students marked exam answers	2 6	This saved o n printing lots of paper as the mark schemes students used to mark the papers could be displayed

Please use the space below to describe any feelings you have about digital technology and your teaching.

3

I use my whiteboard every lesson but would like to use more creatively

Wednesday

Digital technology used in your lesson	Length of time	Purpose	Rate how useful it was to your teaching 1 – very useful 2 – useful 3 - neither 4 – not useful 5 – not useful at all	Describe how the digital technology affected your teaching
Speed dating NHS activity	18 minutes	Students moved around room to pair and up and discuss issues surrounding the NHS	1	It got the students discussing and sharing their thoughts and ideas- Whiteboard was the focus for the activity as different topics and issues appeared on the screen
Alliance systems song	5 minutes	Renforce understanding of the Alliance systems before WW1	2	Useful in terms of being able to display the song on you tube as well as students listening to it
Problems facing Henry VIII	5 minutes	Students follow a trail of images and had to work out what the problems facing Henry VIII were	2	6 Got students focused and engaged especially with use of a countdown bomb timer

Please use the space below to describe any feelings you have about digital technology and your teaching.

2

I have 15 pads in my room but don't feel they are useful except for research.
10 7 Students often misuse them so I rarely use them and feel they are a waste of money

Thursday

Digital technology used in your lesson	Length of time	Purpose	Rate how useful it was to your teaching 1 – very useful 2 – useful 3 - neither 4 – not useful 5 – not useful at all	Describe how the digital technology affected your teaching
Video clip	5 minutes	To show students what happened when Henry VIII made the break with Rome	2	I was able to visually show the students what happened when Henry VIII made the break with Rome
Medical progress images	10 minutes	Students had to sort the images into chronological order	3	It helped students t reinforce their chronological understanding
Timer	15 minutes	To time the students for a practice exam they completed in class	3	6 Useful for students to see how long they had left rather than ask me
What makes a good exam answer	10	To get students to come to the front and highlight what good answer should have	2	Helped to develop discussion with the students and encourage more students to contribute 12 17 13

Please use the space below to describe any feelings you have about digital technology and your teaching.

Friday

Digital technology used in your lesson	Length of time	Purpose	Rate how useful it was to your teaching 1 – very useful 2 – useful 3 - neither 4 – not useful 5 – not useful at all	Describe how the digital technology affected your teaching
Who joined who Alliance starter activity	10	To get bottom set students to work out who joined which alliance by connecting flags	2 18 12 13	Helped to get some less settled students engaged as they wanted to come and use the whiteboard 17
Exam planning activity	15 minutes	Students used the whiteboard pens to mark and highlight key words in exam questions	2 12 13	Got everyone in a small group contributing and highlighting key words rather than just a few people
Video clip	10 minutes	To show the students a recreation of the Atomic bombing of Hiroshima	2	Really helped to being to life the impact of the Atomic bombing of Hiroshima
Why should we remember World War Two Wall?	10 minutes	Students adding their thoughts to brick wall of remembrance	1	Got students up and contributing and sharing their ideas on the whiteboard- became a good starting point for discussion and a useful plenary

Please use the space below to describe any feelings you have about digital technology and your teaching.

Teacher Diary

Subject: Geography, PSHE, Environmental Science

Session: Autumn

Date: Started Monday 1st December 2014

Monday

Digital technology used in your lesson	Length of time	Purpose	Rate how useful it was to your teaching 1 – very useful 2 – useful 3 - neither 4 – not useful 5 – not useful at all	Describe how the digital technology affected your teaching
Interactive Whiteboard and Macbook Pro	1 hour x 4 lessons	Projecting lesson objectives, displaying images and task instructions.	1- Pupils rely on information being displayed to facilitate learning. 1 9	Pupils able to work independently through tasks are check with instructions displayed on the board. Macbook also used to access electronic registers and email staff regarding pupils. 5 9 6 6
HP Laptops	30 mins	Accessing website: http://www.mysusthouse.org/game.html	1- Added variety and a different format to an otherwise dull task. 5	Pupils learnt about sustainable housing and then used the website to use a house building simulator. The simulator reinforced the information covered but added a competitive element. The lesson ended in a competition, which helped peer bonding. 9
Interactive whiteboard	4.36 mins	Showed Youtube video of Indian Ocean Tsunami.	1- No other way of showing a video in classroom.	Pupils used evidence from the video to make notes. Later this information was turned into an extended writing task. Video provided a varied source of information. 9 5

Please use the space below to describe any feelings you have about digital technology and your teaching.

The activity today involving the house building simulator proved to be invaluable for settling a usually disengaged year 10 class. This task was chosen as an alternative to a paper task which proved very popular with pupils. In particular, many became very competitive about scoring the highest on the game. This is a good bonding moment for this group who frequently fall out with each other and rarely engage with the subject.

12 1 13 12 13

Tuesday

Digital technology used in your lesson	Length of time	Purpose	Rate how useful it was to your teaching 1 – very useful 2 – useful 3 - neither 4 – not useful 5 – not useful at all	Describe how the digital technology affected your teaching
Interactive Whiteboard and Macbook Pro	1 hour	Projecting lesson objectives, displaying images and task instructions.	2- Pupils rely on information being displayed to facilitate learning.	Pupils able to work independently through tasks are check with instructions displayed on the board. Macbook also used to access electronic registers and email staff regarding pupils.

Please use the space below to describe any feelings you have about digital technology and your teaching.

Wednesday

Digital technology used in your lesson	Length of time	Purpose	Rate how useful it was to your teaching 1 - very useful 2 - useful 3 - neither 4 - not useful 5 - not useful at all	Describe how the digital technology affected your teaching
Interactive Whiteboard and Macbook Pro	1 hour	Projecting lesson objectives, displaying images and task instructions.	2- Pupils rely on information being displayed to facilitate learning.	Pupils able to work independently through tasks are check with instructions displayed on the board. Macbook also used to access electronic registers and email staff regarding pupils.
HP Laptops	40 mins	Accessing website 'U Explore'.	5	Pupils are working through an online careers programme called U Explore. Each week they complete tasks online as set by myself.
Interactive whiteboard	4.36 mins	Showed Youtube video of Indian Ocean Tsunami.	1- No other way of showing a video in classroom.	Pupils used evidence from the video to make notes. Later this information was turned into an extended writing task. Video provided a varied source of information.

Please use the space below to describe any feelings you have about digital technology and your teaching.

13 12

Pupils very responsive to the video task. Pupils spent half an hour reading and exploring information about the tsunami but they seem to gain so much more from less than five minutes of a video!

17

Uexplore website has proved helpful in providing careers advice to year 10 pupils. Most of the information is available in other formats but the digital format appeals to the age of pupils in the group.

Thursday

Digital technology used in your lesson	Length of time	Purpose	Rate how useful it was to your teaching 1 – very useful 2 – useful 3 - neither 4 – not useful 5 – not useful at all	Describe how the digital technology affected your teaching
Interactive Whiteboard and Macbook Pro	1 hour	Projecting lesson objectives, displaying images and task instructions.	2- Pupils rely on information being displayed to facilitate learning.	Pupils able to work independently through tasks are check with instructions displayed on the board. Macbook also used to access electronic registers and email staff regarding pupils.
Interactive whiteboard	4.36 mins	Showed Youtube video of Indian Ocean Tsunami.	1- No other way of showing a video in	Pupils used evidence from the video to make notes. Later this information was 9 5

			classroom.	turned into an extended writing task. Video provided a varied source of information.
HP Laptops	1 hour (if chosen)	Checking facts/ figures/ key information of case study.	3- Did not facilitate my teaching but have impact on some pupil's learning.	This session was an independent revision session for Year 10 pupils. My teaching was more in support of pupils, not providing new information. Approximately five pupils used the laptops for short 'fact checking' tasks using the internet. This was optional and not essential to the lesson. 8

Please use the space below to describe any feelings you have about digital technology and your teaching.

5 9 6

Giving pupils the option of using the internet to 'fact check' their case studies
Became a much more complicated task than I first thought. Many pupils became
10 Reliant on finding new information rather than consolidation what they already
Knew. For future sessions. I would like to use devices for revision purposes but will
Need to be more prescriptive in how it is used.

Friday

Digital	Length of	Purpose	Rate how	Describe how the

technology used in your lesson	time		useful it was to your teaching 1 - very useful 2 - useful 3 - neither 4 - not useful 5 - not useful at all	digital technology affected your teaching
Interactive Whiteboard and Macbook Pro	1 hour	Projecting lesson objectives, displaying images and task instructions.	2- Pupils rely on information being displayed to facilitate learning.	Pupils able to work independently through tasks are check with instructions displayed on the board. Macbook also used to access electronic registers and email staff regarding pupils.
Interactive whiteboard	4.36 mins	Showed Youtube video of Indian Ocean Tsunami.	1- No other way of showing a video in classroom.	Pupils used evidence from the video to make notes. Later this information was turned into an extended writing task. Video provided a varied source of information.

Please use the space below to describe any feelings you have about digital technology and your teaching.

Teacher Diary

Subject: Geography/RJHE/ Environmental Science

Session: 2. Spring

Date: 1/6/15 -> 5/6/15.

Monday

Digital technology used in your lesson	Length of time	Purpose	Rate how useful it was to your teaching 1 – very useful 2 – useful 3 - neither 4 – not useful 5 – not useful at all	Describe how the digital technology affected your teaching
Macbook, projector, interactive whiteboard	1 hour	Showing visual information	2	Allowed pupils to see images and read instructions

Please use the space below to describe any feelings you have about digital technology and your teaching.

Tuesday

Digital technology used in your lesson	Length of time	Purpose	Rate how useful it was to your teaching 1 – very useful 2 – useful 3 - neither 4 – not useful 5 – not useful at all	Describe how the digital technology affected your teaching
N/A.				

Please use the space below to describe any feelings you have about digital technology and your teaching.

Wednesday

Digital technology used in your lesson	Length of time	Purpose	Rate how useful it was to your teaching 1 – very useful 2 – useful 3 - neither 4 – not useful 5 – not useful at all	Describe how the digital technology affected your teaching
projector, Macbook and interactive whiteboard	3 hours	Showing visual information	2	Allowed pupils to follow instructions.
Laptops / the internet.	1 hour	Pupils researching college courses	1	Allowed pupils to access up to date and relevant information.

Please use the space below to describe any feelings you have about digital technology and your teaching.

1 Being able to access 'real time' information
5 helped to engage and inform pupils of
12 information that would otherwise be
difficult to obtain.

Thursday

Digital technology used in your lesson	Length of time	Purpose	Rate how useful it was to your teaching 1 – very useful 2 – useful 3 - neither 4 – not useful 5 – not useful at all	Describe how the digital technology affected your teaching
projector, Macbook and Interactive whiteboard.	2.5 hours.	Showing visual information	2	Allowed pupils to watch video on relevant topic.
Laptops.	30 mins	Researching definitions.	4	Task could have been done in many other ways.

Please use the space below to describe any feelings you have about digital technology and your teaching.

Friday

Digital technology used in your lesson	Length of time	Purpose	Rate how useful it was to your teaching 1 – very useful 2 – useful 3 - neither 4 – not useful 5 – not useful at all	Describe how the digital technology affected your teaching
	N/A.			

Please use the space below to describe any feelings you have about digital technology and your teaching.

Teacher Diary

Subject: Computing

Session: _____

Date: w/c 15.6.15

Monday

Digital technology used in your lesson	**Length of time**	**Purpose**	**Rate how useful it was to your teaching** **1 – very useful** **2 – useful** **3 - neither** **4 – not useful** **5 – not useful at all**	**Describe how the digital technology affected your teaching** 12 17
Whiteboard	60mins	Display starter and lesson objectives	2	Starter calms class and introduces calm atmosphere
iMacs	55mins	Access computer based content	1	
Internet	40mins	Research key terms	2	5 Enabled independent learning
youtube	35mins	Show video on hacking	1	12 17 Great resource to engage students.

Please use the space below to describe any feelings you have about digital technology and your teaching.

2 7 Videos via Youtube are good but should be used with care regarding over-use and students "swithching-off"

Tuesday

Digital technology used in your lesson	Length of time	Purpose	Rate how useful it was to your teaching 1 - very useful 2 - useful 3 - neither 4 - not useful 5 - not useful at all	Describe how the digital technology affected your teaching
Whiteboard	120mins	Display starter and lesson objectives	2	
Windows desktop PCs	115mins	Access computer based content	1	
Internet	110mins	To search for resources.	2	Enabled student led learning.
Coggle	110mins	To make revision notes.	2	1 5 Great resource to enable students to make notes.
Powerpoint	50mins	To present findings to other students	2	Students were familiar with tool so focussed on content
Whiteboard	60mins	Display starter and lesson objectives	2	
iMacs	55mins	Access computer based content	1	
Internet	40mins	To search for resources for course work.	2	Enabled student led learning.
Dreamweaver	50mins	To create website	1	10 Students sometimes do not know how to use the tools and this takes time to resolve. Good engagement.
Scratch	50mins	Amend / improve games	1	12 17 Great engagement for some students

email	50mins	Create emails and send	2	Very slow sorting access to emails. Hopefully quicker next time?

Please use the space below to describe any feelings you have about digital technology and your teaching.

5

Using Scratch is great as it teaches a skill (coding) and allows creativity.

Wednesday

Digital technology used in your lesson	Length of time	Purpose	Rate how useful it was to your teaching 1 – very useful 2 – useful 3 - neither 4 – not useful 5 – not useful at all	Describe how the digital technology affected your teaching
Whiteboard	210mins	Display starter and lesson objectives	2	Starter calms class and introduces calm atmosphere
iMacs	75mins	Access computer based content	1	
Internet	70mins	To search for resources for game.	2	Enabled student led learning.
Dreamweaver	50mins	To build a website to consolidate learning	2	Great resource to get engagement. 12
Terminal / Virtualbox / Ubuntu	50mins	To teach text commands and complete Controlled Assessment	2	Students struggle to appreciate boundaries of controlled assessment work. They want to be shown the answers.
Powerpoint	50mins	To create a presentation on a topic of their choice	3	Students were not engaged on this task. 12 17

Please use the space below to describe any feelings you have about digital technology and your teaching.

17 S 12 17

Dreamweaver enabled a level of creativity that really engaged the students

Thursday

Digital technology used in your lesson	Length of time	Purpose	Rate how useful it was to your teaching 1 – very useful 2 – useful 3 - neither 4 – not useful 5 – not useful at all	Describe how the digital technology affected your teaching
Whiteboard	270mins	Display starter and lesson objectives	2	Starter calms class and introduces calm atmosphere
iMacs	75mins	Access computer based content	1	
Internet	70mins	To search for resources for game.	2	Enabled student led learning.
Dreamweaver	50mins	To build a website to consolidate learning	2	Great resource to get engagement.
Terminal / Virtualbox / Ubuntu	140mins	To teach text commands and complete Controlled Assessment	2	Students struggle to appreciate boundaries of controlled assessment work. They want to be shown the answers.
Powerpoint	50mins	To create a presentation on a topic of their choice	3	Students were not engaged on this task.
email	50mins	Creating email and sending	2	Very slow sorting access to emails.

Please use the space below to describe any feelings you have about digital technology and your teaching.

10

Yr7 class suffered several problems with internet access. Lesson was less effective.

Friday

Digital technology used in your lesson	Length of time	Purpose	Rate how useful it was to your teaching 1 – very useful 2 – useful 3 - neither 4 – not useful 5 – not useful at all	Describe how the digital technology affected your teaching

Please use the space below to describe any feelings you have about digital technology and your teaching.

Teacher Diary

Subject: Computing

Session: _____

Date: w/c 23.3.15

Monday

Digital technology used in your lesson	Length of time	Purpose	Rate how useful it was to your teaching 1 – very useful 2 – useful 3 - neither 4 – not useful 5 – not useful at all	Describe how the digital technology affected your teaching
Whiteboard	60mins	Display starter and lesson objectives	2	Starter calms class and introduces calm atmosphere 12
Macbooks	55mins	Access computer based content	1	
Internet	40mins	To access lightbot game	2	Game was accessed via search engine
Lightbot game	35mins	To teach algorithms	2	Great resource to teach algorithms. Used this to get students to write pseudocode before typing instructions into game
Whiteboard	90mins	Display starter and lesson objectives	2	Starter calms class and introduces calm atmosphere
Macbooks	75mins	Access computer based content.	1	
Internet	40mins	To search answers to set questions.	2	Enabled student led learning (as request of students). 1 S

Please use the space below to describe any feelings you have about digital technology and your teaching.

12

Having a tool like Lightbot is great for engagement and learning.

Tuesday

Digital technology used in your lesson	Length of time	Purpose	Rate how useful it was to your teaching 1 – very useful 2 – useful 3 - neither 4 – not useful 5 – not useful at all	Describe how the digital technology affected your teaching
Whiteboard	60mins	Display starter and lesson objectives	2	Starter calms class and introduces calm atmosphere
Macbooks / iMacs	55mins	Access computer based content	1	
Internet	40mins	To search for resources for game.	2	Enabled student led learning.
Scratch Programing language	50mins	To teach algorithms	2	Great resource to teach coding.
Macbooks / iMacs	55mins	Access computer based content	1	
Internet	40mins	To search for resources for course work.	2	Enabled student led learning.
Photoshop / Word.	50mins	To document course work	2	Students sometimes do not know how to use the tools and this takes time to resolve.

Please use the space below to describe any feelings you have about digital technology and your teaching.

S

Using Scratch is great as it teaches a skill (coding) and allows creativity.

Wednesday

Digital technology used in your lesson	Length of time	Purpose	Rate how useful it was to your teaching 1 – very useful 2 – useful 3 - neither 4 – not useful 5 – not useful at all	Describe how the digital technology affected your teaching
Whiteboard	90mins	Display starter and lesson objectives	2	Starter calms class and introduces calm atmosphere
Macbooks / iMacs	75mins	Access computer based content	1	
Internet	70mins	To search for resources for game.	2	Enabled student led learning.
Scratch Programing language	75mins	To teach algorithms	2	Great resource to teach coding.
Terminal	20mins	To teach text commands and use text based game	2	Internet went down during lesson and back-up was to move onto using Terminal which was working

Please use the space below to describe any feelings you have about digital technology and your teaching.

10 Network going down caused big problems, and the lesson plan needed to change!

Thursday

Digital technology used in your lesson	**Length of time**	**Purpose**	**Rate how useful it was to your teaching** **1 - very useful** **2 - useful** **3 - neither** **4 - not useful** **5 - not useful at all**	**Describe how the digital technology affected your teaching**
Whiteboard	60mins	Display starter and lesson objectives	2	Starter calms class and introduces calm atmosphere
Macbooks / iMacs	55mins	Access computer based content	1	
Internet	40mins	To search for resources for game.	2	Enabled student led learning.
Scratch Programing language	50mins	To teach algorithms	2	Great resource to teach coding.
Macbooks / iMacs	55mins	Access computer based content	1	
Internet	40mins	To search for resources for course work.	2	Enabled student led learning.
Photoshop / Word.	50mins	To document course work	2	Students sometimes do not know how to use the tools and this takes time to resolve. 15

Please use the space below to describe any feelings you have about digital technology and your teaching.

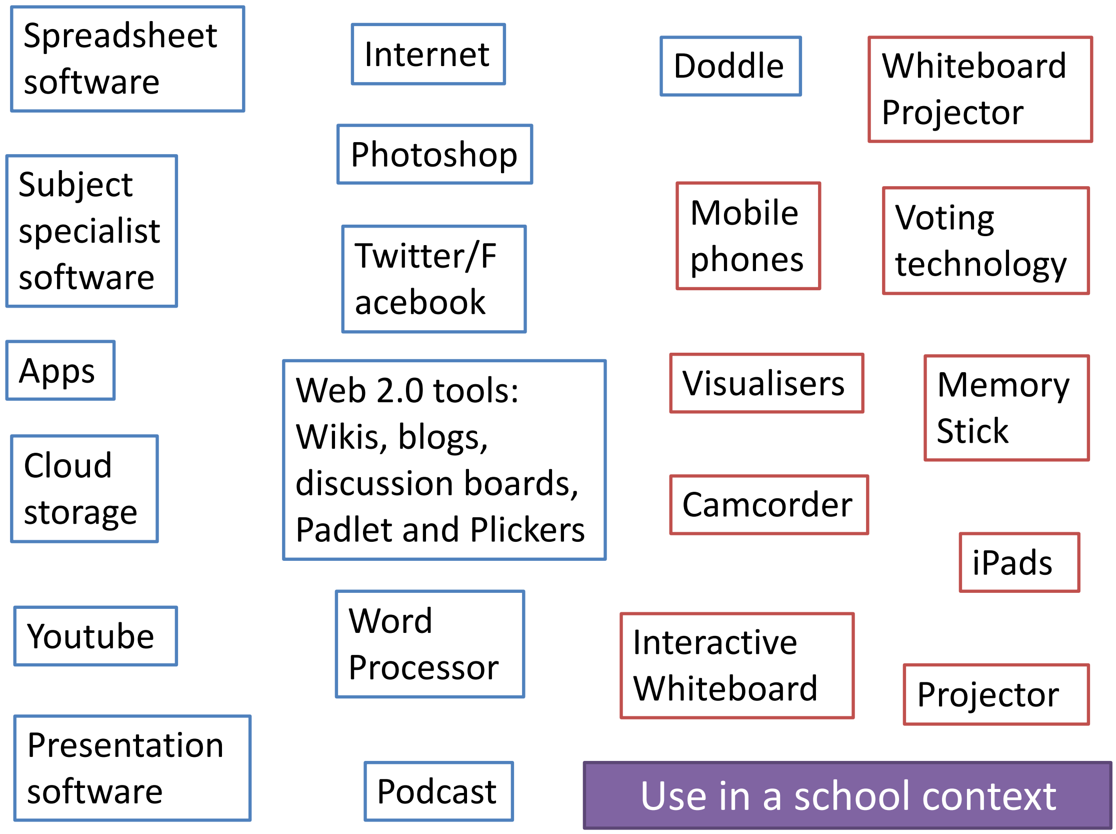
10 Yr7 class suffered several problems, i.e. the MacBook trolley was locked and the key was not available; a version of flash was not up-to-date and could not run a yacapaca quiz or scratch (without opening a firefox browser). The students were patient but this was disruptive.

Friday

Digital technology used in your lesson	Length of time	Purpose	Rate how useful it was to your teaching 1 – very useful 2 – useful 3 - neither 4 – not useful 5 – not useful at all	Describe how the digital technology affected your teaching

Please use the space below to describe any feelings you have about digital technology and your teaching.

APPENDIX I:INTERVIEW LIST OF SOFTWARE



APPENDIX J: STUDENT & TEACHER INTERVIEW TRANSCRIPT SAMPLE

Audio File Name: **Year7**
Date: **31/07/2015**
Duration: **0:15:06**

<u>Key</u>

Cannot decipher = (unclear + timecode)

Sounds like = [s.l + timecode]

I: = Interviewer

R1: = Respondent one: Year 7 Student 2

R2: = Respondent two: Year 7 Student 1

I: **Right, okay it's recording. Good morning, afternoon, whatever. Okay, so use some examples to describe your top three digital technologies for learning.**

R1: The internet.

R2: Yes, the internet.

I: **The internet, go on give me an example of when it's been used well in your lessons.**

Subject specialist apps

R1: I could go on something like My Maths in a maths lesson or something like Sum Dog as well.

S Internet

R2: Or search stuff on Google.

I: **Yes, perfect. Give me another example of a digital technology then and how you've used it well.**

R1: So, we could use like…we also go on the internet, but we could use iPads, so we could use them anywhere round the school.

iPad pro's

I: **Give me a good example of a lesson where you've used an iPad then and it's been successful.**

R1: Well, in the library once we've read a book we've used an iPad to take a quiz on accelerated reading.

I: **Oh, perfect.**

R2: And, we were just doing that for the news stuff.

I: **Oh, so what you where you just doing then with [s.l Miss 0:00:58] -**

R1: Yes.

I: **What were you going to do?**

R1: Like, sometimes we search the news and stuff like that, find out about what's going on in the world at the minute so we can keep ourselves up-to-date.

I: **Good work, and then one more please.**

R2: Word processors.

I: **Yes, give me an example.**

R2: Microsoft word.

I: **And, when have you used that in your lessons and it's been good?**

R2: Stuff like drama, English.

I: **Okay, so give me an example of what you do in English.**

R2: We write stories on it.

R1: We sometimes write book reviews, so you use Microsoft to write reviews on a book we've read and also we use the app Scratch in our computing lesson to make a project, to make basically like a little game or story.

I: **Perfect. Well done guys. Okay, so what mark would you give…what was the first one you said was -?**

R2: The internet.

I: **The internet. What mark would you give out of five for the internet, five being totally useful?**

R1: Probably about a four because some things on the internet like –

R2: A four or a three and a half because -

I: **Three and a half.**

10 16

R1: I'd definitely say four because some things on the internet can be a bit dodgy sometimes, so you could get bad connection or things like that and it's sometimes good to just stick with apps.

R2: Yes.

I: **Okay, brilliant. What about for the iPad?**

R2: I'd say round about maybe a two and a half or a three because sometimes it can get really tedious. 16

– negatives

I: **Why is it tedious?**

R1: Well, I think I'd say about a four again because sometimes people fiddle with the iPad and like change the wallpaper or things like that and it gets

3 16

16

annoying. But, I think they're good because they're portable, so you can take them anywhere round the school, so you could be in (unclear 0:02:30) -

10 15

R2: *Yes, I'm just not very good at using them, that sort of thing.*

R1: Yes, so you could use it in (unclear 0:02:34) and then just walk across and use them in creativity or in year seven zones, you can use them anywhere round the school.

I: Oh, okay, so they're much more portable. That's good. Good word. What mark would you give the word processor then?

R2: *Probably definitely a four.*

I: Four, what about you?

R1: Yes, I'd have to say a four as well.

I: Why four?

R2: *Well, I mean, it's really useful I always get this feeling when I write too much and my hand starts aching.* — word processor pros.

6

I: So, you're not restricted by your own hands when (over-speaking 0:03:04) -

6

R1: And, it's also good because you've got things like autocorrect and things like that, so you don't need to search up spellings on the dictionary just if you type it in incorrectly it will just autocorrect it.

I: Perfect.

R2: *And, you can do stuff like pictures and things.*

I: Excellent. So, how often in a school week do you think, like, per hours do you think you spend using the internet in your lessons?

R1: Probably because obviously we've got a five day week, although a week is seven days, but obviously we're only at school for five of them.

I: Yes, five and there's five hours in your school day.

R1: Yes.

R2: *Is it five hours in a school day?*

I: Hmmm.

R1: There's seven, eight till 12 and 12 till -

I: Yes, but in your lessons though.

R1: Yes, I'd probably say –

R2: *About four and a half hours because for teachers use the internet to get stuff.*

R1: Yes, drama and geography.

I: [S.I Obviously 0:04:30] you'd use that quite a lot?

R1: Yes, in geography we're doing a presentation. In drama we're doing a play.

I: What is your three worst digital technologies then?

R1: I'd say the…I don't know.

R2: Phones. I don't have one. 16

I: You don't have a phone?

R2: I don't have one with the apps and stuff. 16

I: Okay, brilliant. That's a good reason. Give me another one.

R2: I might say the projector sometimes because –

R1: I'd say…sorry, I'd say YouTube.

I: Oh, you don't like YouTube?

R1: Well, not at school I don't because they've blocked everything. 10 You can only listen to like…when you're listening to music you can only listen to like parodies and things like that and they're really annoying. 16

R2: Yes, it's annoying. 16

R1: So, you have to go on places like Viva or use your own music on your phone.

I: Okay, so you don't like the restrictions.

R2: I don't like projectors because sometimes they just give me a headache, 10 if we use them too much.

I: And, are they used a lot in your lessons?

R2: Yes, frequently.

I: Okay, do you feel that you use enough digital technology in your learning?

R2: Definitely. → Agree

R1: No. → Disagree

I: You not?

R1: No.

I: Why not?

For Digital tech use increase

R1: Well, I just think these days everything… I don't like it. I wouldn't say I like it, but everything seems to be based around digital technology. I mean, there's a restaurant in the city that you go in and you order things with your phone and that's just what the worlds coming to and I just don't think we use enough technology these days. Instead of, like, writing a big essay, like, three page essay it would be so much easier and so much quicker to just type it up on Microsoft and you get more done.

7 16 6

R2: Sometimes I think there is definitely a lot of technology and it gets on my nerves quite frequently that there's too much.

7 16

R1: Yes, well see I think the opposite. I think there's not enough. I do think there is not enough…well, I think there is enough, but it's not used enough in school.

← more tech use

3

I: Oh, okay -

R1: With what we have and the ability to use all the stuff we've got like the Macs, the iPads, bigger laptops, everything, we don't use enough, like, when we have the chance to use the interactive whiteboard instead we use a normal whiteboard.

3

R2: Yes.

I: Yes, so how many hours in a general week do you think are spent using digital technology, so teachers using the interactive whiteboards, phones, power points, computers -?

R2: So, it's fine days and five -

I: So, all that digital technology that's on that how many -?

R1: I'd probably say about ten hours.

I: Ten hours out of the 25.

contradictions

R1: Because, I think every English lesson we use the interactive whiteboard, every maths lesson we use it.

Lots of tech use

R2: About half of the week.

I: Half of the week?

R2: Probably because -

I: But, then that's including your teachers using the digital technology and not necessarily you?

R2: Yes, there's like always technology.

I: Would you like to use more? So, yes, you would and, no, you wouldn't.

R2: I'm kind of happy with the way it is, although well I wouldn't mind it, but I just don't want things getting totally out of control.

7 16

R1: Yes.

I: What would you think then are the reasons that digital technology is not being used?

R1: Because, it's too unreliable. 10

I: Okay.

R1: Because, you can get in the middle of your work and suddenly it just lags and freezes and you lose all your work, which of you go back to the tradition of just writing on a piece of paper it's impossible for you to lose it. 10 8

R2: Yes, also -

I: Any other reasons?

R2: I mean, like, if you're on the computer too much it can be bad for your health. It sounds a bit tedious. 16 7

R1: Yes, no, I agree because you stare at a computer screen too much and it hurts your eyes, but then there's other things where you write too much and it hurts your hands, so there's two ways of looking at it. It depends what was as a contrast. 7 16 6

I: So, do you have any examples of when a teacher has maybe used digital technology in your lesson and it's gone completely wrong and you thought, oh, we would have been better off -?

R1: Well, in English we were watching a Harry Potter film and the sound just stopped working and we couldn't fix it and it wasted about 20 minutes of our lesson. 10

R2: Permanently in English we have problems with the whiteboard. 10

I: Oh, really?

R1: Yes.

R2: Permanently.

R1: It just never seems to work. Well, it does eventually so we end up wasting…I would say an hour a week…we've got four lessons a week, so it's four hours. We will probably end up missing about an hours' worth of lesson. 10

I: Goodness.

R2: Yes, that's why technology isn't good because you're waiting for it to load and stuff. 10

R1: But, then on the other hand that's why technology is good because people can't say, I haven't got a pen and then they waste five minutes trying to look for one where they could just type and they don't need a pen. 6

I: Yes, fair enough. So, do you think digital technology makes learning better?

R1: Yes.

R2: Yes.

I: So, give an example of when digital technology has helped you make progress?

R1: Geography. Geography, usually people are talking to each other, distracting each other, on a laptop listening to your music you focus because you're doing the things you like. You're on technology, you're listening to your own music, you're enjoying yourself, but also doing your learning at the same time. S 18

R2: Yes, it's like that in music and drama because if you just write something and just put your headphones in you notice that the class is basically completely silent and it's just…and we're getting more work done, so it's considerably better. S 18

I: Very good. Give an example of when digital technology has helped you to raise your achievement.

R1: Computing goes with that. Computing is what it is and you're on a computer, so without that technology I wouldn't be able to increase my computing levels.

R2: Yes.

I: Good.

R2: And, well I did like a writing contest and I basically instead of spending ages writing it by hand I just typed it all up. 6

R1: I remember because we had…we were performing a play and we had to, like, write a script and things like that and without a computer that would have taken so long. 6

I: Brilliant. So, I'm going to ask this question, I think I know the answer, do you like using digital technology?

R1: Yes. 11

R2: Yes. 11

I: And, does it engage you?

R1: Yes, because technology…without music like I said it makes it unfocused and if you listen to music you can't hear other people talking and you don't want to talk, so people aren't distracted. 12 18 12 S 18 12

R2: Well, it depends. I like using technology, but I don't like it, kind of, when people make you constantly watch technology, which you are most the time. 16 17

I: Oh, okay.

17

R2: *I mean, watching movies is fine because -*

I: So, you don't like the passive digital technology.

R2: *Yes.*

I: Okay. How confident are you with using digital technology in your lessons?

R1: Very confident.

I: Very, so ten out of ten?

R2: *Confident.*

7 20

R1: I wouldn't say very, very, very. I'd say probably about an eight.

I: And eight.

R2: *Yes, not super confident, but confident.*

I: Do you feel your teachers are more or less confident that you are?

R2: *Less.*

R1: Less, definitely.

I: Less confident.

R2: *Yes.*

10 Teachers with tech

R1: They seem to be very tentative when using technology as if like, oh, if I touch this it might go wrong or if I don't do this it might not work, things like that. So, I think if they're more confident in themselves they're more confident in the technology. 20

I: And, how do you think they could get more confident?

R1: Just by using it more so they get used to it and know what it does, know you press this button that happens, then they'll get more confident and they'll use it more. 10 20 3

I: Very good. Give examples of how you use digital technology outside of your lessons for educational purposes?

R2: *Writing, Scratch.*

R1: Yes, I type up at home for my homework.

R2: *Photo shopping.*

R1: For my English homework and I have to write a review I always use Microsoft Word and if I need to put some data I use Excel.

I: Very good. Do you use digital technology for homework?

R2: *Yes.*

R1: Yes, definitely, all the time.

I: Do you use digital technology though if you're not being encouraged by your teachers?

20

R1: Yes, because I think that to be comfortable with yourself and your own technology is key because you don't necessarily have to be told or the teachers [s.l not using it 0:11:45] so I'm not going to. So, there you go.

I: Okay, do you feel pressure to learn using digital technology?

R2: *Can I just say one thing about the last question?*

I: Yes.

R2: *I mean, like, technology is becoming more, kind of, based in the modern world. I mean, like, my mum works at City College so she knows you have to constantly be doing things like spreadsheets and if you don't know things about computing you probably won't actually get that far.* 20 4

I: Very good point [s.l Anushka 0:12:11]. So, do you feel pressure to learn using digital technology?

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R1: No, I think that digital technology makes me more confident in my learning than it does in writing.

I: Very good.

R2: *Sometimes, not always.*

I: How does this pressure effect you?

R1: Well, like I said, I don't have pressure.

I: You don't have, but Anushka thinks she does.

16 4

R2: *Well, like sometimes I think there's more peer pressure about what, kind of, phones you have and -*

R1: Yes, I agree, like, you go and someone's got an iPhone six and you've only got like an iPhone three you get like told –

R2: *I've got a Nokia brick.*

R1: Exactly and people say, oh, you cheapskate you don't get the latest technology and also I know we're talking about technology and not clothes, but if someone shops at Tesco and someone else shops at JD you get told you're just a cheapskate you can't afford nice clothes.

R2: *Yes, if someone shops at Aldi and someone shops at Sainsbury's it's, kind of, annoying because Aldi has good –*

R1: Yes, I shop at Aldi.

R2: We're totally going off track now.

R1: I know let's get back to technology.

I: Okay, so do you think there is a difference between the amount of digital technology used in your learning and the amount that is reported as being used?

R1: No.

R2: Not really, no.

I: No, same, good. In what way does the internet make it easier for you to learn effectively?

R1: Well because you can find out your research so much quicker. 17

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R2: Yes, that's much easier research, like, in DT when we have to do really long boring lessons of just nothing but research.

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I: Perfect. In what ways do you make use of it in your learning while at school, the internet? You've already really covered that, haven't you?

R2: Yes, basically.

R1: Yes, we've answered that.

I: And, outside of lessons then give me some examples of when you use the internet outside of your lessons.

R2: Haven't we done that?

R1: Yes, we've done that.

I: Yes, you've done that. Okay, so right the last thing is then this little sheet. Looking at the hardware do you think the teachers use whiteboard projectors?

R2: Yes.

R1: Yes, all the time.

I: Or do they mainly use the interactive whiteboard?

R1: Oh, interactive.

R2: I don't know because some…quite a few teachers use interactive, but some use interactive, but don't actually do anything about it.

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R1: Yes, so if it's not fixed and then you come three lessons later and it's still not fixed.

I: Oh, okay so they use it if it works?

R1: Yes, they don't sort it out if it doesn't work.

I: What about visualizers? Do your teachers use visualizers?

R2: Yes, they do.

R1: Yes, yes.

I: What about voting technology?

R1: Pardon? Sorry, I couldn't hear.

I: Voting technology?

R1: Voting technology. I don't even really know what that is.

I: No, they obviously don't. Right, brilliant. I think that's it guys thanks you very much. Cheers. Thanks.

[End of Recording]

Audio File Name: **Humanities**
Date: **01/08/2015**
Duration: **0:25:12**

<u>Key</u>

Cannot decipher = (unclear + timecode)

Sounds like = [s.l + timecode]

I: = Interviewer

R1: = Respondent one: Humanities (Geography, PSHE, Environmental science) Teacher 1

R2: = Respondent two: Humanities (RE, English, PSHE) Teacher 3

R3: = Respondent three: Humanities (History) Teacher 2Lack of exposure/

I: **Okay, so between you, so collectively, use examples to describe your top three digital technologies for teaching. So, give examples of how you use them and when it works well, if that makes sense.**

R1: Something from here?

I: **It can be for anything. That was just a list.**

R1: Okay, I quite like iPads, so in terms of for some lessons maybe Key Stage three I think they're quite nice to rather than turning it into a reading task, reading sheets of information and needing to print lots of information, it means kids can access an awful lot of really up-to-date stuff and find it (14) (17) (1) (5) (6) themselves. So, one project we've just been doing on forbidden places they had to go and look at ten places from around the world and find out information about them. If I had tried to print that that would have taken me hours to prepare the resources. It would have been boring for them (13) because they would have just been reading it and actually in doing so loads of them were suggesting websites for each other. They were finding interactive things. They were then swapping over to Google Maps and trying to find Area 51 and what can you see. And, actually I think it was just a nicer experience for them being able to interact with it, even if some of them did find some websites that (10) weren't that accurate, but most of the time it worked really well, so I quite like that. (16)

R2: (17) (5) The things with iPads as well is that it's instant. You can switch them on and start straight away and often that's what puts people of using the MacBook's I think is the palaver of getting them out the trolley, getting logged on, (10) someone's login not working. So, that is really good with the iPads it can be literally a ten minute task, whereas the MacBook's are not worth getting out really unless you're using them for a whole lesson I don't think. Obviously projectors we all use pretty much on a daily basis for most lessons, don't we? Yes, if your projectors not working or something that's a bit of a disaster, so I think we are quite reliant on those. (3) (7)

I: **Do you ever use it interactive?**

R2: I don't because my room is behind the double doors, so every time the kids walk through the doors it goes bong and the wall shakes and it knocks it out of alignment [chuckle] so ever since we moved into this new building I've never used them.

R3: I find it hard to use the interactive whiteboard, you know, I find it hard to use it and engage the kids apart from just writing it and getting the kids to come up and highlight something or pointing things out. I tend to use a lot of it for display being honest with you.

R1: Yes, I do. I just find usually they're so unreliable with actually being aligned and the pens working and the fact that a lot of the time it's like put a pen down to pick one up and the kids just…it doesn't work the same for me. If you're going to do, like, a pen rush or something on the board it still seems so much easier to just do it with a pen on the board.

R2: I think primary schools use them a lot more successfully probably than we do.

R1: I think they do quite a lot of interactive, sort of, literacy things as well, like, you can go through a story and you touch the pages and stuff like that, it makes more sense, but that doesn't really work for secondary school.

I: **Perfect and the third?**

R2: I'd say YouTube a lot of us use a lot which is a great resource and if you go into a school and you're doing something and they block YouTube or something for teachers that automatically makes me think, oh god, because I've got a whole folder on YouTube of clips that I've saved to use for loads and loads of different things. There's stuff that you could show kids a clip of and they instantly got a much better understanding than you could ever give them or they could ever read or anything like that. And, I think it's a really good way for, kind of, say sometimes I might use songs or music videos and things like that as discussion starters and that sort of thing. So, yes, I think it's a brilliant resource and I know for history you do quite often find stuff on there as well, don't you?

R3: Yes, a lot of the stuff that is on YouTube for history you just can't buy by BBC licensing fees and stuff, but you can still get a lot of it on YouTube which is really good just to save a fortune.

R1: Yes, it's perfect for when we're, sort of, doing subjects that are…especially for geography when we're doing things, like, we need to do a particular tsunami right we can go on here and actually find BBC footage that was taken live at the time and actually use it, but again trying to find those a lot of the time even on the BBC websites a lot of their old stuff isn't available anymore, but it is still available on YouTube. I wish I'd contributed more though because there's a lot of, like, geography case studies. So, we've just been doing a river flood, we've just been doing to Boscastle floods and when you type that into YouTube there are so many schools all over the country that are making videos of their case studies and sharing them. You just think it would be quite powerful to actually –

R2: Get the kids to use that more, yes.

R1: - [s.I make some 0:04:20]. If every time they learnt a case study which, you know, can be a bit dry, can be quite exam focused, if it was then a case of, 14 12 you know, we're going to get together and put a minute together each and 7 actually make a five minute video I think it could be quite a nice…I'm just not 10 that confident for making them I think would be a difference, but I think it'd be quite good.

I: I think it would be getting them off the iPads here. Okay, so if you were to give the iPads then a score out of one to five, five being you couldn't teach without it and one being not very useful at all, what kind of scores would you give iPads?

iPad given 2.

R2: I think they have quite limited uses. I think for things like a quick research task they're very useful, but because we can't print from them, we can't save with them unless you're using DropBox or Cloud or something like that, which we're not…a lot of people aren't confident and the kids certainly don't know 15 how to use, I don't think they are particularly useful for anything else really. 20 Unless you're doing, kind of, movie projects or anything like that. I would probably say two because of that because I think it is quite limited their use.

I: Yes.

R3: Yes, I'd probably give it quite a low rating. The problem I find with the iPads is 7 I find it very difficult to monitor what the kids are on because when you're in a 10 computer room like this…I don't know if you have the software where you can sort of keep an eye on what the kids are on. 7

I: No, we don't.

R3: In my old school it used to be literally login to software and you can actually see what's on their screens, which is great because you can say get on with your work. Whereas, obviously with certain groups I won't use the iPads because I just can't trust that they will be on the websites that they should be, 7 10 but, yes, they are quite limited in their use.

R1: I'm quite a bit fan. I'd probably rate them a three, maybe a four on the grounds that, you know, the concept I move into a school that don't have them for me is a big difference because it suddenly means that everything 10 has to be a big task to warrant using them and I think actually, yes, I quite like…I just think they're quite handy. I think it's the fact that you can instantly 17 pick them up and know that they are switched on, they work, you don't need to login, you don't have issues with passwords, you don't…you know, the hold their charge for a long time. I just think, you know, if you've got a lot of access to it quite a lot of the time then you can plan to use them a lot more effectively I think.

I: Brilliant. Same question for projectors then, five being you couldn't teach without it, one being -?

R1: It's got to be five, hasn't it?

R2: Yes, I'd say a five.

14 6 9
7 10 1

R1: The day you come in and your projectors not working it's suddenly like a mad panic of what you going to do? You can teach without them, but it's just…even for independent tasks you just display your instructions, don't you? You use it for a timer. You use it for, you know…I even use it for dates and titles. I don't even write them on the board. It would be a five for me.

6 14

R3: Yes, I think for a lot of teachers now actually a lesson plan is your whiteboard and your…like, I usually use PowerPoint most lessons that's the…instead of writing lesson plan that is the lesson plan and I've had times where if the lamps broken it's a bit of a struggle to, sort of, adapt. I'm like oh my god I'm going to have to think on my feet a bit more. 7 10

R2: Especially I know you and I both we plan for non-specialists a lot, so we are literally giving people here's a lesson and so the PowerPoint is by far the 6 easiest way to do that because, you know, you can put your notes on the PowerPoint as well for the teacher to see, so you know if there's a teacher who's teaching out of their subject area you're giving little hints and instructions. So, yes, I'd say five definitely.

I: Brilliant, and YouTube same question, one to five?

R3: 6 For me as a history teacher definitely a five. It's just the range of stuff on there and the different uses of it for homework, in lessons and researching is just 5 1 invaluable, so definitely a five for me.

R2: A five for me as well, yes.

R1: I'd probably go for maybe a four. We can kind of get away without it and I find sometimes the only problem is you have to, you know, watch videos in advance because you can't presume they're all going to be good just because the name sounds like they are going to be good because sometimes it's not 9 that, you know, appropriate. But, it is really handy even if it is just like a three, 17 four minute clip that just grabs their attention of just explains something really 17 12 difficult or, you know, something that they need a visual for. So, yes, we'd go 14 for a four.

5

I: Brilliant. How often per week do you use digital technologies then? Did you…was this an average week in your diaries or pretty representative?

R2: Yes, I didn't actually put down my projector and if I'd have put down my 9 projector it would have been every single lesson, so that's my misunderstanding of what you meant. But, yes, I use my projector pretty much every lesson, so, yes, and computer probably maybe three lessons a week on average. Some weeks if we're doing…you know, if year nine are doing a research based project it will be a lot more and then some weeks I might not use it all, so, yes, it is quite…it all depends on availability as well is 10 something, is being able to book them.

R3: Yes, I definitely use it all the time, every lesson, even if it's just to place some 14 instructions, anything like that, it's just something simple. It's always on, yes, definitely. 1 5

R1: Yes, definitely every lesson for the projector.

I: What are your least three used digital technologies then?

R3: Mine would have to be mobile phones. It's a bit of a bugbear for me in this school because students do abuse when they have their phones out, but I've started to use them a bit more in terms of just getting kids to take a snapshot of homework on the whiteboard because they haven't got their planners half of them. But, I would love to try and use mobile phones more in lessons and try use it a bit more creatively.

R2: Apps I must admit I don't really use that because I don't use the iPads particularly often. I know there are some subjects where obviously there's loads of thigs that have been developed for those subjects, but it doesn't really lend itself particularly, yes, so I haven't really had much experience of using apps.

R1: I think, sort of, the web-two tools like blogs and that kind of thing I tend to stay away from because I really worry about, particularly with Key Stage four, about actually giving something that's a fact and not someone's opinion. And, I think a lot of the time lots of the blogs you've got there will be people talking about different exam specs and that kind of thing can be quite helpful, but I never tend to send pupils to them because I just think that they're going to get, you know, someone's idea of what it is and obviously what we're doing here is very different. So, I tend to not…you know, I tend to send them, sort of, BBC Bitesize or something factual rather than sending them to a blog.

I: Yes, it's a good point. Okay, so do you feel that you use enough digital technology in your teaching?

R2: I think you've got to make it work for you and use it to deliver what you want to deliver rather than use it because you think you should be using it. So, I think a lot of it does depend on the availability thing. If I had a trolley of either MacBook's or iPads or something in my lessons, like, in my room all the time, yes, I probably would use them more, but you kind of almost plan without them and then think, oh, can I get them? How can I adapt it? But, I think…yes, I think sometimes it's, kind of, shoehorned in and actually we should use it to assist our teaching, but not necessarily use it because it's there, if you see what I mean.

R3: Yes, I don't think I use enough variety of different technologies in my lesson. I tend to stick to what I'm comfortable with and I think I should maybe get more out of my comfort zone and use more that's available. I think it's more my, kind of, insecurities and some of the times the kids come into lessons and they know so much more about technology than I do, but what I use I try and use creatively, but I definitely need to be more open-minded and use more variety.

R2: I think staff would welcome training actually. I think part of it is not knowing what's out there and how to use it, so actually if there was more training available to say, oh, this is a tool you could use in this way I think staff would, you know…people would get on board with it, but I think it's maybe lack of exposure to it is one of the problems.

R1: I think there are some that I'd like to use more in an out of school way, like, having just come out of training we did have training on how to use things like iPads and we had hour long sessions on how to use them in your lesson, but at the time I was teaching in a school that didn't have any iPads. It wasn't really something that you used. But, I'd love to be able to use relevant apps and things on YouTube to, kind of, set things for pupils and be able to signpost them to them, but I've tried to set homework's before based on, you know, watch this YouTube clip, have a go with this and just haven't got a particularly positive response and have ended up having to do, you know, a homework at the end of the day with kids sat in my room watching the video on the whiteboard anyway, so it's sort of a bit…you need…you know, kids need to be…I think to use it in that way which I think could be really powerful it's quite…you have to rely on them actually doing it sensibly as well at home.

I: **Perfect, you just answered all my other points. Do you think digital technology is effective for teaching? So, like, do you think it drives progress or that it drives achievement or have you got any examples of when students have made progress with digital technology which otherwise would have been -?**

R2: I think not on its own it doesn't drive progress. I think it can be a useful tool, so for example, I've taught English this year as well and with the Year 11's drafting coursework using the computers had they been writing their coursework and going back and editing it by hand we wouldn't have got anywhere near the level of accuracy that they got. And, actually it was very valuable in that way for them to be able to go back look at a second draft, proof read, you know, change the typos and that kind of thing. So, yes, I mean, it was invaluable in that situation. Had they been handwriting it we wouldn't have got anywhere near the success we had, so I would say in terms of driving progress that was a real, you know, a good example.

R3: Yes, we've used it effectively in controlled assessment in particular when they're doing…part of their controls is they have to do an independent enquiry, so we use a lot of digital technology for that. I think good teaching drives progress first and foremost, but a good teacher who can make good use of technology can really help students progress.

R1: I've used spreadsheets quite effectively, but I'm not really sure if it was the spreadsheet that made it effective or the meeting. So, I used to meet with pupils and get them to set their own targets, you know using a spreadsheet, but it's probably the conversation that was more helpful than the spreadsheets.

I: **Yes, what about do students like digital technology and just thinking about engagement?**

R2: I think they get bored of it very quickly. I think when we moved into this building and everything was shinny and new and we had all this technology that we didn't have before it was a real, kind of, buzz around it. But, I think kids…well all of us, we get used to things very, very quickly and so it's possibly not the kind of exciting thing it once was. They see it much more every day now and actually they have no idea how lucky they are when you go and look at other schools who have hardly any of the equipment that they have access to. So, yes, I think it does ware off, but they would definitely miss it if it wasn't here.

I: Okay, how confident are you with using digital technologies in your lessons? So, like, I don't know, rate yourself one to ten, one being not confident, ten being very confident.

R3: I would say I'm probably a five. I'm confident with certain areas of technology, but really would like to be more confident in other areas. I think part of maybe holding back is not taking a risk with technology and maybe getting it wrong. So, yes, I'd say I'm about a five. 10 7

R1: I'd probably guess slightly higher in terms of I'm quite willing to try something that could completely fail, so in that sense I will give it a go, but I think that's based on having, you know, a basic understanding on how most of these work and, sort of, thinking it will be fine. But, you know, also relying on the fact that you might be trying something for the first time that the kids might have used in another lesson or used at home or used in another way, so I think it would probably be sort of slightly higher on that. 20 20

I: Perfect.

R2: I'd probably say five because if I look at this list I probably use definitely less than 50% of it on a regular basis, so, yes. I mean, I'd be happy to try, but if I'm honest about my current practice I don't use hardly anything on there, so…

I: Perfect. Do you feel your students are more or less confident than you?

R2: Probably more at some things. I mean, yes, what I find really funny is that when I had IT at school we learnt how to use Excel, we learnt how to… the more, kind of, I suppose nitty-gritty IT, so actually when it comes to doing things on word and stuff like that I find that the kids actually really a lot of them don't have a clue how to do some of the things on there. I think even basic things like saving. It always amazes me how some of them don't know how to save their work. But then, you know, when it comes to a lot of the more internet based stuff that wasn't as available when I was at school, so I think, yes, the more traditional IT stuff I probably have a better idea about, but a lot of the internet stuff they do. 20 15 10 20 15

R1: I think the pupils rate themselves probably wrong in terms of confidence on the computers anyway because I think a lot of the time they presume because of the generation and the frequency with which they use them that they're better. But, I frequently deal with things in lessons of like what do I type into Google to find this? Where do I save it? Which button do I press to print it? You just, sort of, think these aren't difficult questions, like, a lot of the time, you know, they can find ridiculous videos from all over the world, but they can't actually do necessarily, you know… you say practical things that we were sort of taught to do, especially in an age when the floppy disk button for save, none of the kids know what a floppy disk is, so if they don't have words they just have pictures none of them know which button to press to save it anyway because they've got no idea what it was. So, I think a lot of the time they're not as confident as they think they are. 20 15 20 10

R3: I think with the whole mobile phones now you can do so much on there, like, what you two have both said they've lost sight of the basics of, you know, IT and I think they're not as confident in everyday stuff, but like you say get them 20 on the internet and social media and stuff they know their way much more than what I do.

R3: Or cracking the schools Wi-Fi code [chuckle] they're pros at that sort of thing.

I: Yes, they're very good at that. Okay, so you've talked about training to increase your confidence. Is there any other ways that you think you could increase your confidence?

R1: Observing someone else's lesson of them using it well would be good. So, if someone was very up on…like, I have observed lessons in the past that have been led from…their boards been led, you know, from an iPad and someone's been walking round the room. It's a science lesson and they were literally using their iPad to film an experiment that happened really quickly, but then literally linked it up to the board and managed to show in slow motion what had happened in this science experiment and then, sort of, printed it in stages and they did…and actually it was brilliant. What they done with it was brilliant, but I think sometimes you need to see someone else's idea of how they've made it relevant to their subject and see them do it well to sort of think, oh, actually I could have a go at that, so I think…

R2: You could almost have, like, a champion for each of these things and ask people if they would mind, you know, filming a five minute clip of them using it in a lesson and have that resource base to give people idea of how I can practically and physically work in a lesson. I think often that's the thing. We get so, kind of, bogged down with planning our lessons that you don't think about trying new things and if you do you think I haven't got time for that or I'll do that next year or whatever it is. So, yes, I think a lot of the time it's people saying this is how you could actually use it is what people need, practical advice.

I: Perfect, just two main questions, so do you feel pressure to use digital technology in your teaching?

R2: When we first moved into this building we did because obviously we had so much funding for technology there was a real push and the whole school had three days apple training when we first got here and so there was a real you need to be using it all the time and I don't think there was necessarily the scrutiny into how they were being used and sometimes you'd walk past classes and see kids on laptops and you think what are they actually doing? I think we've maybe wised up to using them slightly smarter now than we did then. So, I think people have kind of backed off the idea, oh, if you're not using it you're not doing good teaching. I think people now think, yes, you know, they're useful for obviously certain things, but just having laptops in a lesson doesn't make it a good lesson.

R3: Yes, I think there can be the danger with technology you can make lessons flashy, but not purposeful and I've seen some examples of that, not just here, but in my previous school. I think sometimes less is more in terms of technology, which can be –

[Interruption to interview not transcribed 0:22:02 - 0:22:04].

R1: I think in terms of the pressure I probably feel it more with the kids, certainly in this school I do. The school I worked at last year they were looking at putting funding into iPads and they were pushing for…well they just got outstanding Ofsted, it was kind of like you need to learn how to use these to bring in, like, shiny things to your lessons. But, in this school where there is an awful lot of available technology I don't feel any pressure at all from staff to actually use it and actually book them out. Whereas, the kids because other people are the kids are frequently, are we doing that on the iPads? Are we doing that on the laptops? You know, the want to make videos, they actually want to use it. Whether that's a good thing or not I'm not sure because I think a lot of the time they want to use it because they think they can just listen to music and not really work that hard.

R2: As a smoke screen.

R1: But, at the same time I think here there's more pressure form the kids to try and use it because they know it's here.

I: Yes. In what ways does the internet make it easier for you to teach effectively?

R3: Research, planning, it makes a huge difference. I mean, to plan a history lesson without the internet would be very difficult I think now, so it makes a huge different in terms of that for my subject.

R1: It probably does, you know, especially teaching geography a lot of the things we do are current affairs related, so it's one of those things where it's not just the internet, but you need something that's quite up-to-date, doesn't exist in a book yet, so sort of, you know…there was a situation when the tsunami happened in the Philippines, it literally happened the day before I was due to start teaching a whole unit of tsunamis and we were doing a completely different one and by using the internet I was able to sit that night and completely rewrite it, so we did what was happening live. We could watch footage of it, we could see newspaper articles, you know, you can see information from all over the world and from various sources, so in that sense it would be near on impossible to plan lessons like that without the internet because otherwise everything would be at least 15 years out of date because it would be in a book.

R2: I think it gives you the ability to be flexible and spontaneous as well, you know, if kids take something off in a different direction, you know…a lot of what happens in my lessons, especially at GCSE is a lot of, kind of, discussion and working through arguments and that kind of thing, so actually it means I've got the ability to quickly think, oh, we could look that up or there was a news story about this ten years ago, you know, that kind of thing. So, it means that even if I haven't thought out every possible route the lesson could take you can change tact halfway through or you can pick up on what a kids saying, oh, yes, that's really interesting let's follow that up, you know, and finding examples of stuff at a drop of the hat it's invaluable, yes.

R1: Especially if the kids got something that's so on topic it's great and they just, sort of, say –

R2: Yes, oh, did you see that on the news Miss, yes.

R1: (Over-speaking 0:24:49) did you see that? You can just instantly, kind of, click on and look at it. I think it's nice for them to feel like they're contributing, but

1 also just to make that…and to see that you're willing to minimise your 14
5 PowerPoint and actually look at it, take them seriously, it's quite nice. 17

I: **Brilliant. Thanks guys. Minimise your PowerPoint I like that, that's going in there.**

R3: I haven't been able to do that yet.

[End of Recording]