"It's teaching Jim, but not as we know it": An examination of the beliefs and attitudes of teachers to the use of technology in Further & Vocational Education from a teacher's perspective.

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Title

"It's teaching Jim, but not as we know it": An examination of the beliefs and attitudes of teachers to the use of technology in Further & Vocational Education from a teacher's perspective.

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Abstract

This study sought to understand the beliefs and attitudes of teachers in Further and Vocational Education regarding the use and usefulness of technology in their teaching practice. Policymakers and advocates view increased access to, but continued under-utilisation of technology as indicative of how the sector is failing to meet the expectations and demands from industry. This study examined the underlying perceptions of teachers and identified the barriers and enablers that presented themselves to technology integration. I wanted to gain an understanding in what ways and how often teachers were using technology in their teaching practices. Additionally, teacher's perceptions about the potential contribution that technology could make to their teaching practice would be explored. The study was completed in three phases; the first was an online questionnaire distributed through the college intranet networks and yielded 229 responses. The second phase was another online questionnaire; and this one was distributed directly to teachers that had confirmed that they would be prepared to continue with the study and was sent to 31 teacher's work email addresses resulting in 21 completed surveys. Eleven one-to-one interviews completed the third phase of the study. The interviews used photo-elicitation to examine the beliefs of the teachers from the Further Education (FE) colleges across a range of subject areas. Each phase of the research was designed to elicit information relating to teacher's perceptions of the utility and value of technology in their teaching. The results presented in this thesis reflect many of the findings from previous research from other education sectors, namely schools and universities; however other perceptions reflected the uniqueness of the Further and Vocational Education sector and are perhaps a reflection of the demographics of the sector. The main findings of the study were that several barriers existed to the integration and use of technology, a perceived lack of time along with lack of training and support in how to teach effectively using technology. Insufficient provision and access to technology within colleges meant that there was a reliance on students using personal devices to supplement lack of provision in the college, raising issues in low socioeconomic areas. Additionally, there was a perception that technology integration had been superseded in recent years by other CPD mandated for external audits and inspection.

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Statement of Copyright

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Dedication

To my family and friends, you have always been a source of support and encouragement and believed that this day would be possible, my inadequate words cannot express my true feelings and eternal thanks.

Chapter 1 - Background, rationale & context of the study.

1.1 Background.

This thesis explores teacher's beliefs concerning the integration and use of technology in Further & Vocational Education Colleges in the delivery of courses across a range of levels and disciplines. There has been a high level of investment in the provision of technology across all sectors of education. This investment has been with the expectation, from government and policymakers, that teachers will have more time and be able to focus on other aspects of their role, not just on teaching (Department for Business Innovation and Skills ((DfBIS)), 2014), and that student engagement and consequently attainment will improve as a result (Chandra & Lloyd, 2008). There remains little in the way of conclusive evidence of improved learning outcomes or higher attainment by students, and a fundamental debate continues to rage between sceptics and advocates as to whether technology supports traditional delivery techniques or provides a radically different vision of pedagogy (Livingston, 2012).

Technology integration within Further Education teaching and learning remains sporadic and inconsistent. Classroom practices remain comparatively unchanged from what has been termed 'chalk and talk' approaches despite the introduction of technology. There has been little in the way of the fundamental change that was envisaged by policymakers. There have been "thousands" of methods and innovations presented that have claimed success in improving education unfortunately, they rarely lead to strategic changes nor are they adopted by teachers (Hattie & Yates, 2013), it appears there is a "reshuffling [of] the pack of cards, but little evidence of anybody trying a new game" (Goodson & Mangan, 1995, p.626).

Further & Vocational education is primarily associated with preparing students either to continue education at a higher level or to develop the skills an individual will require for work and working life. Preparing students achieved by identifying the knowledge required and providing an environment where learners can use and apply that knowledge to develop the skills required in the workplace (Billett, 2011; OECD, 2012; Spöttl, 2013).

The challenges faced by the country from global competition and emerging economies has been identified by the U.K. Government as a potential threat that could impact on the economic wellbeing of the country and success in meeting these challenges "depends on the people in further education…in teaching and learning and in using technology effectively in teaching and learning" DfBIS (2014, p.3). Most of the teachers in Further & Vocational Education have worked in professions and industry before becoming teachers. It is because of the time spent working, before becoming teachers, that often means they have different characteristics and profiles to teachers and lecturers in other sectors of education. The average age of teachers in the further education is over 46 years this is seven years older than secondary schools in England and Wales and six years older than in U.K. Universities (Cambridge Assessment, 2016; Frontier Economics, 2017; Higher Education Statistics Agency, 2015).

My interest in this research area materialised while was working abroad in the Middle East, first as a teacher in a Government college and then as a Deputy Principal. The government had similar beliefs to those expressed by the U.K. government, that technology is a powerful medium that can transform teaching and learning (DfBIS, 2014; Department for Education and Skills ((DfES)), 2003). A result of this belief was the procurement of technology in all education sectors. This investment was primarily based on the belief that the integration would enable students and learners to acquire the skills necessary to become integrated members of the 21st Century workplace (Anderson, 2008; Valtonen et al., 2015) and the country to become less reliant on immigrant workers. Nevertheless, although governments have invested in the procurement of the technology the wholesale technological and pedagogical revolution in education has not transpired (Ertmer & Ottenbreit-Leftwich, 2010; Howard, Chan, Mozejko, & Caputi, 2015; Plesch, Kaendler, Rummel, Wiedmann, & Spada, 2013).

On many occasions, while working abroad, questions arose as to why teachers were not using technology, primarily interactive whiteboards (IWB), to make the lessons more engaging for the students. The rather simplistic response was to ask in return who had taught the teachers how to teach using the technology other than to convert existing materials to produce Powerpoint presentations and use the IWB as a projector screen. The assumption of the managers and perhaps policymakers reflected the viewpoint that all that was needed by teachers to use technology effectively in the classroom and change the entire classroom into a student-centred environment where students are fully engaged and improve attainment was "some technical skills and a good attitude" (Zhao, Pugh, Sheldon, & Byers, 2002). I needed to understand what the underlying reasons were that led teachers only to use the technology provided in such a rudimentary way.

Since the 1990's research has been conducted regarding the integration of technology into education and teacher attitudes, beliefs and perceptions concerning this integration. Other research has addressed and examined whether teacher autobiographies are in any way linked to their use of technology in terms of teaching practice. This research has been from different countries, Cyprus (Mama & Hennessy, 2013), Switzerland (Petko, 2012), Australia (Prestridge, 2012), Taiwan (Liu, 2011) and the U.S.A. (Ertmer & Ottenbreit-Leftwich, 2010). Much of this research focused on the integration and utilization of technology in a variety of school systems (Blackwell, Lauricella, Wartella, Robb, & Schomburg, 2013; Petko, Egger, Cantieni, & Wespi, 2015; Scherer, Siddiq, & Teo, 2015).

The focus of the study was the Further & Vocational Education sector as there has been little in the way of research conducted in this sector. The Skills Commission recommended that Vocational Education pedagogies should become a research priority (Skills Commission, 2010). Reflecting on personal experiences and reviewing the literature in the area, the rationale for this study was to gain a better understanding of why the technology that is available in Further & Vocational Education institutes is not utilized more extensively and effectively by teachers. I wanted to explore the extent to which this phenomenon existed in similar institutes in different locations in England. I sought to uncover the educational and professional profiles of the teachers employed in the institutes and conduct self-administered surveys to provide background information and data related to teacher engagement with technology from their perspective and to build a picture of the participants in the study.

Additionally, I wanted to examine the belief and attitudes of the teachers and whether these beliefs and attitudes manifested themselves as barriers to the integration of technology into their teaching practice. I wanted to understand the nature of any barriers from the teachers' perspective, to identify how these may be overcome and therefore facilitate a better integration of technology into the classroom. The research questions developed from an examination of these themes.

1.2 Research Questions.

There is no requirement for teachers engaged in Further/Vocational Education to possess any formal teaching qualification unlike other sectors of the education system. This is either because they were teaching prior to 2007 or have been engaged after this date on the basis that they achieve a teaching qualification after engagement. I wanted to investigate the self-efficacy of teachers in using and integrating technology and after a review of the literature developed research question.

1. How do teachers in Further/Vocational Education use and integrate technology into their teaching practice?

The main area of research was to investigate teacher's beliefs and attitudes in their teaching practice towards the use and integration of technology in Further and Vocational education colleges. The research that has identified the existence of these barriers has largely been conducted in schools and as a result a gap exists in the types and barriers that exist in the Further/Vocational Education sector. The investigation of the existence of barriers to the integration of technology led to the second research question.

2. What barriers and facilitators exist to inhibit or support the use of technology in Further/ Vocational Education?

The final research question presented was to examine the beliefs of the teachers concerning the integration of technology into their teaching practice. The perceptions of teachers toward technology and the perceptions of others to teachers was examined. Research question three examined the area of teacher beliefs and attitudes about technology integration.

3. What are teacher's beliefs concerning the integration and contribution technology can make to their teaching in Further/Vocational Education?

1.3 Scope of the Study.

The study purpose was to investigate the beliefs of teachers concerning the integration and use of technology in their teaching practice and was conducted across nine Post-Compulsory Further Education Colleges in England in three phases; the first was an online questionnaire distributed through the college intranet networks and yielded 229 responses. The second phase was another online questionnaire, distributed directly to teachers who had confirmed that they would be prepared to continue with the study. Thirty-one surveys were sent, resulting in 21 completed surveys. Eleven one-to-one interviews completed the third phase of the study.

The profile of the participants was they were all teachers in the colleges delivering courses ranging from Level 2 to Post-Graduate Diplomas. Participants held Academic qualifications ranging from Level 4 through to PhD with varying levels of teaching and industry experience. The connection between the participants was that they all worked in similar types of post-compulsory colleges, they deliver similar types and levels of courses and before teaching had industry and employment experience in the industry/professional area in which they teach.

1.4 Significance of Study.

The study specifically investigated the beliefs and attitudes of the teachers from the participating Further & Vocational Education Colleges regarding the usefulness and place of technology in their teaching practice. There have been numerous studies conducted in schools and Higher Education, but little in the way of research in the post-compulsory Further Education sector. I believe that the benefits concerning the use of technology in education may have been overstated. Successive governments have promoted the use of technology in education as a means of achieving better engagement and attainment by students; this study investigated the reality of the situation from the perspective of the practitioners who face the reality of teaching every day. I hope that the study results might influence future direction and policy involving the integration of technology in Further & Vocational teaching. The study results will highlight the beliefs, perceptions and barriers that are constructed, held or identified by teachers in this area. I see this study as potentially informing management within colleges about the skills that teachers have and identifying any deficiencies in skills that need to be overcome to enable technology to be integrated more effectively into teaching practices. The study will also identify how technology is used by teachers in the colleges and what they perceive technology integration to mean. It will provide data related to the concerns of teachers that manifest themselves in resistance and barriers to the integration of technology. The study may inform teacher training course developers as to the skills that need to be acquired and become embedded during teacher training.

1.5 Structure of this Thesis.

In Chapter 2 of the thesis, the Literature Review begins with establishing the context of the study, positioning Further and Vocational Education in the broader Education sector. An examination of the context of post-compulsory education and the perceptions of stakeholders at all levels will be presented. The characteristics of teachers within the sector will be explored to determine any unique or particular traits taking into account the industry or professional skills that the teachers possess. The final sub-section of the first part of the review will investigate the management and external decisions that can impact and influence further and vocational education.

The perception of technology in the education sector will be investigated, and the concept of barriers to the integration of technology examined in part 2 of the literature review, two well-established models, will act as a reference for the barriers, first and second-order barriers identified by Ertmer (1999) and the conditions for classroom innovations set out by Zhao, et al. (2002). There will then follow a review of the barriers that have been identified and accepted as relevant to the integration of technology in teacher's classroom practices. These barriers will be mapped against the two models identified earlier.

The final section will identify the conditions that have been proposed for technology to be successfully integrated into teaching and learning, examining briefly technology adoption models reviewing established and accepted models outlining the conditions necessary for technology integration to be successful in education.

The methodology and design Chapter 3 is where I detail the research methodology selected, outline and discuss research philosophy and the theoretical underpinning of the study. A justification for deciding on an interpretive approach for the study is set out, and the reasoning for discarding alternative approaches will be stated. The design and methods used for data collection and analysis will be outlined, the chosen methods having been approved by the university ethics committee (Appendix A), and the rationale for the selection of the preferred methods presented. There is a clear statement of the sample selection process and how the participants became part of the study. The final section of the chapter will outline the ethical considerations adhered to throughout the study.

The results presented in chapter 4 relate to the data collected from the Phase One self-administered online questionnaire. This questionnaire examined perceived self-efficacy regarding the use of technology in preparation of lessons and classroom practices. The second section examined potential barriers to the integration of technology identified by teachers in the study and evident in previous research. The final section identified the Continued Professional Development (CPD) offered or undertaken by teachers in the study in the use and integration of technology.

The results detailed in Chapter 4 are a summary of the statistically significant results only, and provide the background data for the study as well as addressing some of the issues presented in the research questions that will be expanded on and set out in greater detail in Chapter 5.

Chapter 5 is where I explore the results of the interviews and how they address the core aim of the study regarding technology integration and teacher beliefs and attitudes. During this chapter, thematic analysis provides rich detail and addresses the research questions while cross-referencing back to the Literature Review to ensure quality, rigour and the trustworthiness for the study. The results address each research question individually as far as possible, but the focus of these results will be in answering research questions as well as building on and supporting the results data presented in Chapter 4.

In Chapter 6, sets out and discuss the main findings of the study that have been presented earlier in Chapter 4 and Chapter 5. The discussion section of this chapter will address the research questions in turn and present the key findings. The limitation section will discuss the constraints of the study and what could have been approached differently and suggest how future research could address these. The chapter concludes with recommendations in the areas of management policy within the colleges to better meet the needs of teachers and thereby achieve the desires of the policymakers and government while considering implications for teachers and practitioners.

Chapter 2 - Literature Review.

2.1 Introduction.

This research focused primarily on the barriers and enablers that are perceived to exist by teachers in the Further & Vocational Education sector concerning the integration and use of technology in the context of their teaching and learning. The context of the study defines technology as any device, platform or programme used or integrated into the teaching practice of tutors and teachers. Technology could be interactive whiteboards (IWB), smart boards, computers' either desktops or portable devices, smartphones or other portable devices with internet connectivity, computer programmes or applications (apps), this list is not prescriptive and could include other devices or applications. In this chapter, the literature that has informed the study will be examined.

The first section of the chapter outlines the broader position and context of Further & Vocational Education. Sub-sections will establish the context in which Further and Vocational Education operates and the perceptions of the sector from several stakeholders. The types of teaching and delivery used within Further and Vocational Education will be explored, the section will conclude with a review of the management practices and external policies that impact on the sector and the potential effect they have on teachers.

The second section of the review will examine and identify the literature that forms the main body of the study, exploring the barriers and enablers that are perceived by teachers to exist regarding the integration of technology in their teaching practice from their standpoint. The section will begin with setting out the ideas and concepts around barriers and enablers. Two models will be introduced and compared that have contributed in this area of research, First and Second-Order Barriers first identified by Ertmer (1999) and Conditions for Classroom Technology Innovations proposed by Zhao et al. (2002).

The third section will consider those barriers and enablers that have already been identified by researchers as impacting on the integration and use of technology in classroom practices. The final section will introduce the models relating to integration and adoption of technology incorporating the work of Rogers (2003), Shulman (1987) and Mishra and Koehler (2006) outlining the considerations and conditions that are necessary for technology to be adopted and integrated successfully.

2.2 Context of Vocational Education.

2.2.1 Introduction.

Many governments express similar beliefs to the U.K. Government of 2014 that technology offers the potential to transform teaching and learning (DfBIS, 2014; DfES, 2003). There has been significant investment to support the provision and integration of technology into education (De Witte & Rogge, 2014; Nagel, 2014; Vaughan, 2013), based mainly on the expectation that technology integration into teaching and learning will enable students to engage more effectively with the curriculum and acquire the skills necessary to become fully integrated members of the 21st Century workplace and broader society (Anderson, 2008; Valtonen et al., 2015). Despite this investment, the wholesale technological and pedagogical revolution in the education sector, that was envisaged by policymakers, has not transpired and technology integration remains inconsistent and elusive (Ertmer & Ottenbreit-Leftwich, 2010; Howard et al., 2015; Plesch et al., 2013).

Much of the research conducted thus far has investigated the integration of technology in the school sector (Ertmer & Ottenbreit-Leftwich, 2013; Prestridge, 2012; Sang, Valcke, van Braak, Tondeur, & Zhu, 2011) and Higher Education (Al-Qirim, 2011; Hu & McGrath, 2011; Venkatesh, Croteau, & Rabah, 2014). There has been limited research in the post-compulsory sector, as identified by the Skills Commission, who recommended that “Vocational and applied pedagogies should become a research priority” (Skills Commission, 2010, p.14).

In the first part of the Literature Review, the focus will be on three key issues, the context and perceptions that exist regarding Post-compulsory education, the teaching and delivery methods used in the sector and the differences in teacher characteristics within the sector. In addition, an examination of the changes that have taken place since 2000 that have impacted the sector and the teachers employed in Post-Compulsory Education will be carried out.

2.2.2 Context, and Perceptions of Post-Compulsory Education.

Further and Vocational Education in England forms part of a more comprehensive learning and skills sector, alongside workplace education, prison education, and other types of non-school, non-university education and training. Post-compulsory education in Further Education Colleges (FEC) is distinct from the education offered in universities; it may be at any level from basic skills training to higher vocational education such as City and Guilds or Foundation Degrees. Further Education in the United Kingdom usually includes education for people over 16, excluding universities. Colleges in England that are part of the F.E. sector include general F.E. (GFE) and tertiary colleges, sixth form colleges, specialist colleges (mainly colleges of agriculture and horticulture and colleges of drama and dance) and adult education institutes (Department for Education ((DfE)), 2012).

There is a diverse choice of courses available in Post-Compulsory Education with thousands of available courses varying widely in length, level, degree of difficulty and specialisation. These can range from courses taken as pastimes, personal interests or hobbies, basic skills courses, Science, Technology, English and Maths (STEM) courses that are deemed as necessary by government. Academic subjects at ‘O’ and ‘A’ Level and subject-specific Vocational courses studied at many levels up to and including foundation degrees and Post-Graduate courses in conjunction with universities. There is a wide diversity in both the kind of courses delivered and type of learners participating in Post-Compulsory Education in the U.K. with differing purposes for study and varying levels of motivation to undertake study.

Despite this Post-Compulsory Education continues to be primarily perceived as developing the skills an individual requires for work in a career or profession, identifying the knowledge needed and providing an environment where learners can use and apply the knowledge to develop life-skills as well as the skills necessary for work (Billett, 2011; OECD, 2012; Spöttl, 2013). However, some of the courses offered have uncertain value in the labour market and often low prospects for progression on to higher levels of education (Hupkau, McNally, Ruiz-Valenzuela, & Ventura, 2016).

Changes within the sector during the last twenty years, the launch of the Regulated Qualifications Framework (R.Q.F.) in January 2018 as the latest manifestation of Qualification Frameworks dating back to 2004, set out equivalency between qualifications within different sectors of the education system. There are clearly defined pathways and mapping between qualifications and levels of study across Vocational and Academic courses to Level 8 or Doctoral Level in England and Level 12 in Scotland. The development of the framework demonstrates that it is possible within Vocational Education to achieve high-level qualifications that could address the perception that Vocational Education qualifications are not of as much value as academic qualifications. Nevertheless, despite this opportunity, many parents and potential students have taken the view that Higher Education qualifications provide a more advantageous position within the labour market (Tomlinson, 2008; Atkins & Flint, 2015).

In the U.K., in Feb 2019, there were 303 Further Education Colleges (FEC) showing a decline of 99 from 402 in 2011, this decrease was across England, Wales and Scotland. The number of students participating in Further Education (FE) programmes has correspondingly dropped by 1.2 million from 4.8 million in 2011/12 to 3.6 million in 2016/17. During this period participation in Higher Education (HE) had increased with the latest figures showing an increase of 100,000 between 2015/16 and 2016/17 to 2.5 million (Association of Colleges, 2019; Department for Education ((DfE)), 2018). This decline in numbers could reflect the choices made by students and parents based on the perceptions that they hold about Post-Compulsory Education in Further Education Colleges.

Coupled with the perceptions of parents and students regarding the worth of Vocational Qualifications, there persists a belief from other stakeholders that Post-Compulsory Education has failed to address the skills, needs and expectations of business and industry (DfBIS, 2014). The European Center for the Development of Vocational Training (Cedefop) reported that while there was “evidence of closer collaboration between the worlds of education and work” there was still an identifiable skills shortage and gap, one possible conclusion drawn, other than genuine skills shortage, was a “lack of international recognition of qualifications” (Cedefop, 2015, p.8) which could potentially limit social mobility and opportunity.

Despite the negative perceptions expressed, Post-Compulsory Education has the potential to make a valuable contribution to the economic wellbeing of the country, society and individual growth and development. For these reasons, it should be considered an essential and worthwhile sector of the education system (Billett, 2014). Billett (2014) goes on to warn this will only be achieved when Vocational Education has demonstrated it can meet the expectations of all stakeholders, only then is it likely to be accepted as an essential contributor to a nations' education system. Negative perceptions will be a challenge to overcome because, as Wolf (2011) states, an estimated 350,000 16 – 19-year-old students are getting little or no benefit from post-compulsory education. In most developed countries, some two-thirds of the workforce have learned a substantial part of their job-related skills and knowledge through non-academic technical vocational education (UNESCO-UNEVOC, 2007). Given that Vocational Education has the potential to impact directly and contribute to the overall economic wellbeing and success of the country it is remarkable that its practitioners struggle for the level of social recognition that would establish it as a well-regarded profession (Grollmann, 2008).

The adverse perception of Further and Post-compulsory Education is not universal in all countries and in the German-speaking world it does enjoy a higher status, whereas in other countries where it has an equally strong tradition and is a long-established sector of the education system, it continues to suffer from low status and negative perceptions (Billett, 2011, 2014; Feather, 2017; Wolf, 2011). Within the U.K. because of these negative perceptions Further and Vocational Education still seems to lack identity (Simmons & Lea, 2013), and be regarded as the 'Cinderella' sector of the education system (Feather, 2010; Simmons, 2008).

The U.K. Government has identified the challenges faced by the country from global competition and emerging economies. Successive governments believe that success in meeting these challenges "depends on the people in further education…in teaching and learning and in using technology effectively in teaching and learning." (DfBIS, 2014, p.3). In more recent times and indeed since the late 1990's successive U.K. governments have started to recognise the potential of the sector to address some of the broader challenges that are faced by the country going forward. The recognition that Post-Compulsory Education can contribute to the economy, through training and developing the future workforce, has led to more significant and increasing scrutiny. This scrutiny, coupled with higher demands and influence from business and industry, has increased the number of external interventions in the Further and Vocational Education sector (Billett, 2011; Hyland & Winch, 2007; Lucas, 2013).

Post-Compulsory education falls under the umbrella of Office for Standards in Education (Ofsted), since it became the dominant partner in a merger with the Adult Learning Inspectorate (ALI) in 2002 (Burnell, 2017). This merger introduced changes aimed at raising standards in the sector but has also led to changes in practices with the introduction of a regime of inspection comparable to the one operating in schools. Ofsted has the authority to influence college operations in many areas through direct and indirect pressure and influence. Not all these interventions are welcomed and are viewed by some as "unwarranted interference and external mandation by external bodies seeking to control and stipulate the provisions, processes and outcomes in unhelpful ways" (Billett, 2014, p.2).

Interventions have included determining Continued Professional Development (CPD) of staff and the introduction of Observed Teaching and Learning (OTL) and have had far-reaching implications for the sector at every level, "making an impact on careers, classroom practice and, for some, a decision on whether to remain in the sector" (Burnell, 2017, p.228). The policy changes were made to raise standards in the Further Education sector and have established almost exclusively the use of the Ofsted four-point graded scale to measure performance. Teachers are encouraged to adopt classroom practices, including using prescribed resources, that comply with the criteria determined to be 'good' or 'outstanding' on the Ofsted grading scale (Gleeson, Hughes, O' Leary, & Smith, 2015). In this way, levers are in place and used by policymakers to exert pressure on college management and as a result on teachers to comply with their demands through this 'downward pressure of audit, funding and managerial reform' (Gleeson 2014, p.26).

Historically teaching in further education colleges was based around the practice of learning from skilled and knowledgeable practitioners with the quality of delivery assessed primarily on subject expertise rather than education practices (Harkin, 2005). Many of the teachers and tutors having worked in professions and trades before becoming teachers have experience of working with young people and adults in a variety of work environments. The average age of entry into the sector for a teacher is 37 years (Gleeson, 2014). The reliance on professional expertise and subject knowledge maintained the perceptions among teachers that they were primarily skilled practitioners or professionals who taught in whatever way they believed to be consistent with their subject while being supported by mentors, colleagues and line-managers (Lucas & Nasta, 2010). Recruitment into post-compulsory teaching is often through the unofficial apprenticeship of part-time work provided teachers have the specific skills needed in the labour market. Progression tends to be less linear and more complex than entry into schools and H.E. It is based primarily on potential teachers possessing the required skills and workplace experience, rather than a more academic route from school to university and then teaching, because of this the characteristics of teachers can be somewhat different from other sectors (Gleeson, 2014; Lucas & Nasta, 2010). These teacher characteristics are not unique to Post-Compulsory Education, the government are engaged at present in recruitment drives to engage professionals from business sectors into school teaching, but they do operate in a different context from other sectors in the education system.

2.2.3 Further and Vocational Education Teaching and Delivery.

Until the early part of the 21st century, there was little in the way of uniform standards and qualification requirements for teachers employed in the Further and Vocational Education sector (European Agency for Special Needs and Inclusive Education, 2014). The primary focus, prior to 2007, had been on industry experience with no statutory requirement for post-compulsory teachers to have a formal teaching qualification in the U.K. Teachers in Further Education usually became teachers after many years gaining experience in other occupations, this was due in part to the predominantly vocational nature of further education (Lucas & Nasta, 2010; Orr & Simmons, 2010). "This contrast[ed] with other European countries and with schools, where staff have long been required to have an initial teaching qualification" (Avis, Canning, Fisher, Morgan-Klein, & Simmons, 2012, p.15; Skills Commission, 2010; Thompson & Robinson, 2008).

One of the consequences of this is that teachers in the sector suffered from a perceived lack of status within the profession, reflected in lower salaries and less attractive employment conditions when compared to teachers in schools and universities (Education International, 2009; Grollmann, 2008; Skills Commission, 2010). The changes in standards in 2007 have meant that Further and Vocational Education teachers are now required to be doubly qualified, qualified in their field and qualified to teach this reflects many of the standards and requirements that already existed in other countries (Avis et al., 2012; Grollmann, 2008). Nevertheless, as Grollmann opines “it is remarkable that its practitioners so lack the level of social recognition needed to establish it as a well-regarded profession” (Grollmann, 2008, p. 535).

Recruitment of suitably qualified personnel has proven difficult. The U.K. government recognise that F.E. is not perceived “as a sufficiently attractive career option”, with the sector failing to attract the “best young graduates”. They also recognise that some government policies make it harder for colleges to recruit suitable individuals with an additional barrier to recruitment being the time it can take to achieve a Teaching Qualification in Further Education (TQFE) (DfBIS, 2014; Harris, Simons, & Maher, 2009; Noel, 2006).

The changes implemented in Post-Compulsory Education at the behest of Government, inspectorate and management has meant that the role of teachers within Vocational Education is changing. The focus is no longer merely on teaching; there has been the addition of new roles such as supervisor, mentor, counsellor and adult trainer (Hughes & Attwell, 2010; Kats, van Lakerveld, & Smit, 2010; Sirk, Liivik, & Loogma, 2016). The perception from the government is that technology integration will free up the teacher's time for these other activities (DfBIS, 2014).

It is important to recognise that the characteristics of Vocational Education teachers differ from other sectors in various respects, they are generally older than schoolteachers when they enter initial teacher training (Lucas & Nasta, 2010). Gleeson (2014) determined the average age on entry into the sector as 37 years. The average age of teachers in the post-compulsory sector is over 46 years, with almost 40% of teaching staff aged 50 years or older (Frontier Economics, 2017). The average age of teachers is seven years older than secondary school teachers in England (Cambridge Assessment, 2016) and six years older than academic staff in U.K. universities (Higher Education Statistics Agency, 2015). Furthermore, it has been suggested that Further Education teachers are slow to adopt new practices and ideas with teaching remaining didactic with little in the way of professional development (Orr & Simmons, 2010).

Teachers in the post-compulsory sector are not required to hold a teaching qualification on engagement, provided they are prepared to work towards achieving one, usually within two years. While working towards this qualification, they continue to teach and develop a teaching style dependent primarily on the support from colleagues in the workplace and their prior experience in education as students (Lucas & Nasta, 2010). The context and demands of Further Education suggest there is little recognition of the dual identity of teachers undergoing teacher training, as a student and employee, they are often unable to benefit from reduced teaching load or off-the-job training due to the demands of the role (Lucas & Nasta, 2010; Orr & Simmons, 2010). Teaching styles develop through experience over many years; this experience and industry background may reflect personal views or beliefs of the purpose of education and how subjects are delivered.

As stated previously, Further Education teachers can be slow to adopt new ideas and practices (Orr & Simmons, 2010). However, there have been significant, and numerous changes introduced to the sector since the late 1990's with over thirty new initiatives in the area of technology integration in education alone (Watson, 2001). This avalanche of initiatives continues but, as Somekh et al. (2004) identify, there is little evidence of evaluation or analysis of the previous initiative having taken place before the following one is implemented, often resulting in initiative overload (Hattie & Yates, 2013).

Change involves confronting the unknown, losing the familiar and divorcing the status quo, it also represents a significant disruption to established patterns of behaviour, work methods, procedures and job skills which increases ambiguity and uncertainty. Cuban (2011) illustrated the difficulties when he stated that policymakers determine change based on "criteria of *organizational* effectiveness, efficiency, and equity. Teachers accept, modify, and reject innovations on similar criteria, but with the focus on *students* and *classrooms*." It is not the change itself that is the problem, but often it is introduced with a lack of understanding, resources, time and, as is often the perception, from above, it is implemented rapidly and not thought through thoroughly leaving teachers to cope with the consequences (Dinham & Scott, 2000; Harris et al., 2009).

2.2.4 Management and External Policies.

Not all the changes affecting Further Education are directly as a result of government policy. College managers can also introduce changes that could shape and change the operations and culture of a college that are independent of government policy. Staff faced with this situation try to reconcile the demands for change from management and policymakers with the internal beliefs and values that they hold (Edward, Coffield, Steer, & Gregson, 2007).

There is a growing practice of government regulation and reform (Hyland & Winch, 2007; Lucas, 2013), and a fundamental shift in management practices in colleges, as part of the marketplace reforms introduced in the Public Sector, since the 1980’s. These reforms have resulted in the adoption of "Taylorist" and corporate practices within Further Education to "cheapen labour" the result of which is fewer staff, working harder and longer and teaching more students (Feather, 2017; Mather, Worrall, & Seifert, 2007).

The growth of directive management and audit cultures, coupled with competitive funding, have had profound effects on the working lives of teachers in Further Education. The proliferation of performance criteria and target setting has led to teachers questioning what constitutes a ‘good’ teacher under the new performance management regimes driving the sector (Plowright & Barr, 2012; Shain & Gleeson, 1999). The regime changes have led to a language of competitiveness not only between colleges, but also between college departments (Avis, 2007; Garbett, Orrock, & Smith, 2013).

Performance-based management systems and a culture of internal and external auditing has added to teacher’s workload with constant demands for information, target grades, progress grades and attendance information, which demand attention and are considered an everyday function of the role of teachers (Bailey & Colley, 2015). Increased workloads resulting from these trends find teachers working consistently over hours, with work spilling over into personal time including holidays (Avis, Bathmaker, & Parsons, 2001; Jephcote, Salisbury, & Rees, 2008).

Studies highlight a plethora of good ideas and educational innovations that have produced very little in the way of tangible improvements (Carpenter, 2000; Kozol, 2005). There are significant issues related not to resistance to accept change, but more the uncoordinated haphazard and uncritical acceptance of any innovation without scrutiny and evaluation (Fullan & Stiegelbauer, 1991). Hattie and Yates (2013) conclude there are “thousands” of methods and innovations presented that have claimed success in improving education; unfortunately, they rarely lead to changes, and as a result, the classroom has remained unchanged for 200 years (Tyack & Cuban, 1997).

2.2.5 Section Conclusions.

The literature reviewed in this section outlined the placement of Further and Vocational Education and the context in which it operates from, whether it is in recognised colleges of Further Education or specialist subject colleges in areas such as agriculture and the performing arts, prisons and workplace learning. There is a bewildering variety of courses in the level and duration of subjects delivered ranging from formal recognised courses leading to recognised qualifications to informal qualification in subjects that are for hobbies or personal interest, but primarily FE is to enable learners to progress to higher level of education or prepare them for the workplace through the acquisition of employment-related skills.

Although it is possible to achieve high-level qualifications through Vocational Education, most students and parents believe that the route to better employment prospects lies through Academic courses and university, this has resulted in a decline in the number of colleges and FE students and an increase in university student numbers. The perception that the qualifications gained through the vocational education pathway are not of as much worth as academic qualification belies the fact that further and vocational education can contribute directly to the economic wellbeing of the country by training the workforce of the future.

Recognising this fact successive governments have introduced changes, in an attempt to raise the standard of teaching in the sector, resulting in a regime of inspection and audit overseen by Ofsted, this regime has impacted directly on classroom practices and teachers alike. The adoption of corporate practices within Further Education has had the effect of "cheapen[ing] labour", resulting in fewer staff working harder and longer and teaching more students (Feather, 2017; Mather et al., 2007). These changes have had a profound effect on the working lives of teachers in Further Education.

The proliferation of performance criteria and target setting has led to teachers questioning what constitutes a 'good' teacher under the new performance management regimes driving the sector (Plowright & Barr, 2012; Shain & Gleeson, 1999). Increased teacher's workload with constant demands for information is considered a normal part of the role of teachers (Bailey & Colley, 2015).

Not all these changes have been welcomed or understood with teacher recruitment often based on teachers having the necessary workplace skills to train the future workforce.

Teaching is considered to be learning from skilled and knowledgeable practitioners with the quality of delivery assessed primarily on subject expertise rather than education practices. As teaching is for many teachers in the sector a second career, the characteristics of teachers in further and vocational education are somewhat different to teachers in other sectors. The status of teachers in the sector is also perceived to be lacking, with lower salaries and less attractive employment conditions. Given this background and changes that have been introduced it is important to consider the implications of these initiatives for FE teaching. This thesis explores just one of these initiatives concerning the integration and use of technology into teaching practice.

2.3 Barriers, attitudes and beliefs related to technology integration.

2.3.1 Introduction.

It has been suggested that in the 21st Century digital technology will become as important and influential as the book was in the 19th century (Livingstone, 2012), and as a result there has been significant and continued investment by many governments to support the provision and integration of technology into the educational sector (De Witte & Rogge, 2014; Nagel, 2014; Vaughan, 2013). This investment has primarily been based on the belief that the integration of technology into the classroom will enable students and learners to engage more effectively with the curriculum and acquire the skills necessary to become integrated members of the 21st Century workplace and the broader society (Anderson, 2008; Valtonen et al*.,* 2015). Although this is the belief of government and policymakers there has not been the envisaged wholesale technological and pedagogical revolution in the education sector (Ertmer & Ottenbreit-Leftwich, 2010; Howard et al*.,* 2015; Plesch et al., 2013).

2.3.2 Position of Technology in Education.

When trying to establish the position of technology in education there appears to be a lack of clarity and definition as stated by Watson (2001, p. 253) when he argues "Is I.T. a subject in its own right, or is I.T. a tool to be used mainly for the [teaching and] learning of other subject[s]?" The perceived inability to clearly define the position of I.T. led to continual change since the 1980's when I.T was based on computer science and defined as "The rigorous academic discipline, encompassing programming languages, data structures, algorithms,…" (Royal Society, 2012, p.5). In modern life technology and I.T. has become all-encompassing and has brought about a shift in focus in which the necessary skills and applications of I.T. became the primary emphasis of the curriculum eventually manifesting itself in the creation of the new subject area of technology.

The most recent change proposed and implemented by the U.K. Government in 2014 and heavily influenced by the demands of business and industry, has been to once more focus on a rigorous computer-science based curriculum. With this change, there appears little consideration of students who do not have the aptitude or skills to undertake such a technical academic programme. These changes of position manifest themselves in upheavals in the classroom resulting in lack of clarity or certainty, "The greatest problem we face with educational technology has little to do with recognizing that it must be an essential part of teaching and learning. Rather it is a lack of clear vision as to its real purpose and usefulness in shaping the educational system of the future." (Roblyer, 1993, p.13)

For more than 25 years, there have been several propositions regarding technology integration in education. Hawkridge (1990), presented four rationale related to the benefits from the integration of computers and technology in education which continue to resonate to this day:

- economic rationale: for the workforce of the future the development of technological skills will not be optional, but a necessity to integrate into a skilled workforce, possession of these skills will relate to future jobs and careers;
- social rationale: members of society will be familiar with computers and how it impacts on all aspects of daily life thereby becoming better informed;
- educational rationale: technology is a positive development method to improve teaching and learning;
- catalytic rationale: technology is expected to stimulate and accelerate educational innovations.

In the intervening period, the economic, social and educational rationale presented by Hawkridge (1990) have shown greater convergence (Tondeur, Hermans, van Braak, & Valcke, 2008) as technology has become more pervasive. Even so the wholesale integration and use of technology in education is far from accepted by many practitioners, technology is viewed by many from the perspective of not only being a catalyst for change, but also necessitating changes to teaching and learning styles (Watson, 2001).

Despite the rationale presented by Hawkridge (1990), there appears to be continued intense discussion taking place concerning the place, usefulness and role of technology in teaching and learning. Advocates and supporters suggest that technology use develops many of the skills necessary to effectively contribute to a diverse, sustainable and robust economy (Akcaoglu, Gumus, Bellibas, & Boyer, 2015; Johnson, Adams Becker, Estrada, & Freeman, 2015; Lim, 2007). Despite these claims, a US Congress report found no identifiable difference in results for reading and mathematics between using technology, computers and subject-specific programmes when compared to more traditional teaching methods. (Dynarski et al., 2007). The National Education Association (NEA) in 2008 concluded that there was a shortage of “classroom environments that permit students to engage with technology in a way that prepares them to use technology in the real world” (NEA, 2008, p.19) and business leaders have long held the opinion that Information Technology (I.T.) and computer skills need to be more rigorous to satisfy the demands of industry and the wider economy.

Others present a more cautious view that technology is not a panacea to cure the ills within education nor that better technology means better education (Earle, 2002; Kirschner & Selinger, 2003). There remains little in the way of conclusive evidence that technology has improved learning outcomes or leads to better attainment by students (Stevenson, 2013). The fundamental debate continues to rage between sceptics and advocates as to whether the purpose of technology is to support traditional delivery techniques or provides a radically different vision of pedagogy based around soft skills and technology-led student-centred learning (Livingston, 2012).

Studies conducted previously explored the possibility that technology-supported education improves the academic achievement of students whether this be through an element of competition in a gaming environment, (Burguillo, 2010; Hwang, Hung, & Chen, 2014; Sung & Hwang, 2013), interacting with animated pedagogical agents (Davey & Parker, 2010) or using Multi-Media Instructional Materials (MIM) (Lee, Hsiao, & Ho, 2014).

Conversely, others have highlighted that there is more to learning and learner achievement that technology cannot support, these include the social aspects of learning and the importance of social interaction in learning (Dillenbourg, Järvelä, & Fischer 2009; Kreijns, Kirschner, & Jochems, 2003; Meyer, 2002). With such dichotomous positions held and little in the way of consensus there seems to be an overriding position that endures with practitioners that “Good teaching remains good teaching with or without the technology” (Higgins, Beauchamp, & Miller, 2007, p. 217) and technology in education is more akin to “reshuffling the pack of cards, but little evidence of anybody trying a new game” Goodson and Mangan (1995, p. 626). There is perhaps an unrealistic expectation from government and policymakers alike that teachers might discard the familiar and adopt the unfamiliar in the "general risk aversion [environment] in teaching" (Howard, 2013, p. 357).

2.3.3 The Concept of Barriers to technology integration.

2.3.3.1 First and Second-Order Barriers.

The characteristics of first and second-order change in organisations proposed by Levy (1986) concerned organisational change management. It was stated that first-order change was quantitative and remained within the old way of thinking and acting, second-order change was qualitative and required a new state of thinking and acting. Brickner (1995) extended this concept of first and second-order change and proposed barriers to change when studying computer usage by mathematics teachers.

The successful integration of technology into teaching and learning requires many barriers to be overcome. Ertmer (1999) proposed a simple two state model identifying first and second-order barriers to the introduction of technology in teaching. First-order barriers are observable, measurable and extrinsic often displayed as deficiencies, deficits in infrastructure, reliability, shortages of computers, absence of software, lack of technical or pedagogical support, non-specific training for teachers and shortage of time through increased teacher workloads and demands (Ertmer, 2005; Prestridge, 2012). Government investment has addressed some first-order barriers with the result that technology is now more common in many classrooms across all sectors of education. There continues to be many sources of on-going frustration, infrastructure deficiencies, access to computers when required remains an issue in many institutes and adds to rather than eases teacher's concerns (Plesch et al., 2013). There are also unintended consequences from the on-going existence of first-order barriers and restricted access to technology.

More significant than addressing first-order barriers is the recognition of second-order barriers that are the 'real gate-keepers' to the integration of technology and begins to acknowledge the degree of change required in teacher's beliefs and understandings. Second-order barriers are intrinsic, embracing the core values that teachers have and often concern the core beliefs of what constitutes teaching, added to this is the concept of self-efficacy and confidence in using technology. Within these barriers are the personal beliefs and attitudes of teachers and the degree of change required in teacher's understanding and beliefs to integrate technology, these have been deemed much more difficult to address (Blackwell et al., 2013; Ertmer & Ottenbreit-Leftwich 2013; Howard, 2013).

Trying to define teacher beliefs is a complex and often confusing exercise (Etrmer, 2005; Prestridge, 2012). Teacher's beliefs are not immediately identifiable, consistent or quantifiable and based on personal experience and emotions, beliefs often shape teacher perceptions of what constitutes teaching and are linked to their experiences as students and are shaped by the context in which they operate. Beliefs become stronger over time and seem to exhibit no logical connections between differing beliefs (Hansen & Stephens, 2000; Joram & Gabriele, 1998; Lofstrom & Poom-Valickis, 2013). Beliefs, therefore are far more influential than knowledge in manipulating behaviour (Griffin & Ohlsson, 2001; Nespor, 1987; Pajares, 1992). Pedagogical beliefs form over many years of experiences, from life as a pupil in the classroom (Keys, 2007; Richardson, 2003) to the variety of professional contexts teachers' encounter. Long-standing beliefs are supported by strong authority and broad consensus (Albion & Ertmer, 2002), and though beliefs are not easily changed, it does not mean that they cannot be changed (Prestridge, 2012).

Self-efficacy is one form of belief that has been explored and specifically relates to beliefs about our abilities to do or accomplish something Self-efficacy acts as a second-order barrier to the effective integration of technology into the classroom. Ertmer & Ottenbreit-Leftwich described the influence of self-efficacy thus "knowledge of technology is necessary, [but] it is not enough if teachers do not also feel confident using that knowledge to facilitate student learning" (Ertmer & Ottenbreit-Leftwich, 2010, p.261).

Teachers appear comfortable using technology for familiar tasks within their personal and working lives. Still, there is a perceived lack of confidence associated with how to use technology for instructional purposes (Bingimlas, 2009; Prestridge 2012; Wiseman & Anderson, 2012). Moreover, the fundamental pedagogical beliefs of teachers will determine the style of teaching that they adopt in the delivery of classes (Bandura, 1986; Clark & Peterson, 1986).

Policymakers and government actively promote the belief that teaching is undergoing an evolutionary change, shifting from a teacher-centred to a student-centred activity, but ultimately teachers will determine the level of integration based on their perceptions of what benefits technology can bring to the classroom. Teachers form their own beliefs about the role and position of technology as a teaching tool, the value that it can offer to students in terms of learning outcomes and perhaps, more importantly, their self-efficacy and competency. These beliefs intersect with teachers' established beliefs about pedagogy and as stated by Prestridge (2012) can be a point of 'collision' or 'collusion' and technology is viewed as an add-on to established practices, or as a means of accomplishing real change in practices. Despite this teaching styles and classroom environments have remained mostly unchanged for 200 years (Akcaoglu et al*.,* 2015; Prestridge, 2012; Shin, 2015).

The first and second-order barriers to technology integration model presented by Ertmer in 1999 identified barriers in two categories as extrinsic and intrinsic. These barriers were a fit depending on the quantitative and qualitative nature of the situation, representing deficiencies of some nature as extrinsic barriers and the more intrinsic barriers as individual characteristics of practitioners. This binary representation of a complicated situation led to the development of a model containing eleven factors in three domains that can impact technology integration and was presented by Zhao et al. (2002).

2.3.3.2 Conditions for Classroom Technology Innovations.

Zhao et al. (2002) presented an expanded model of barriers to technology integration. They identified 11 factors that contribute to the success of technology integration in teaching and learning. This model related to an individual teacher introducing technology into teaching and learning; however, many of the factors identified apply to technology integration in the broader context. The categories identified where the person, the context and the project to be integrated. Each of the domains has additional contributing factors associated with the central theme.

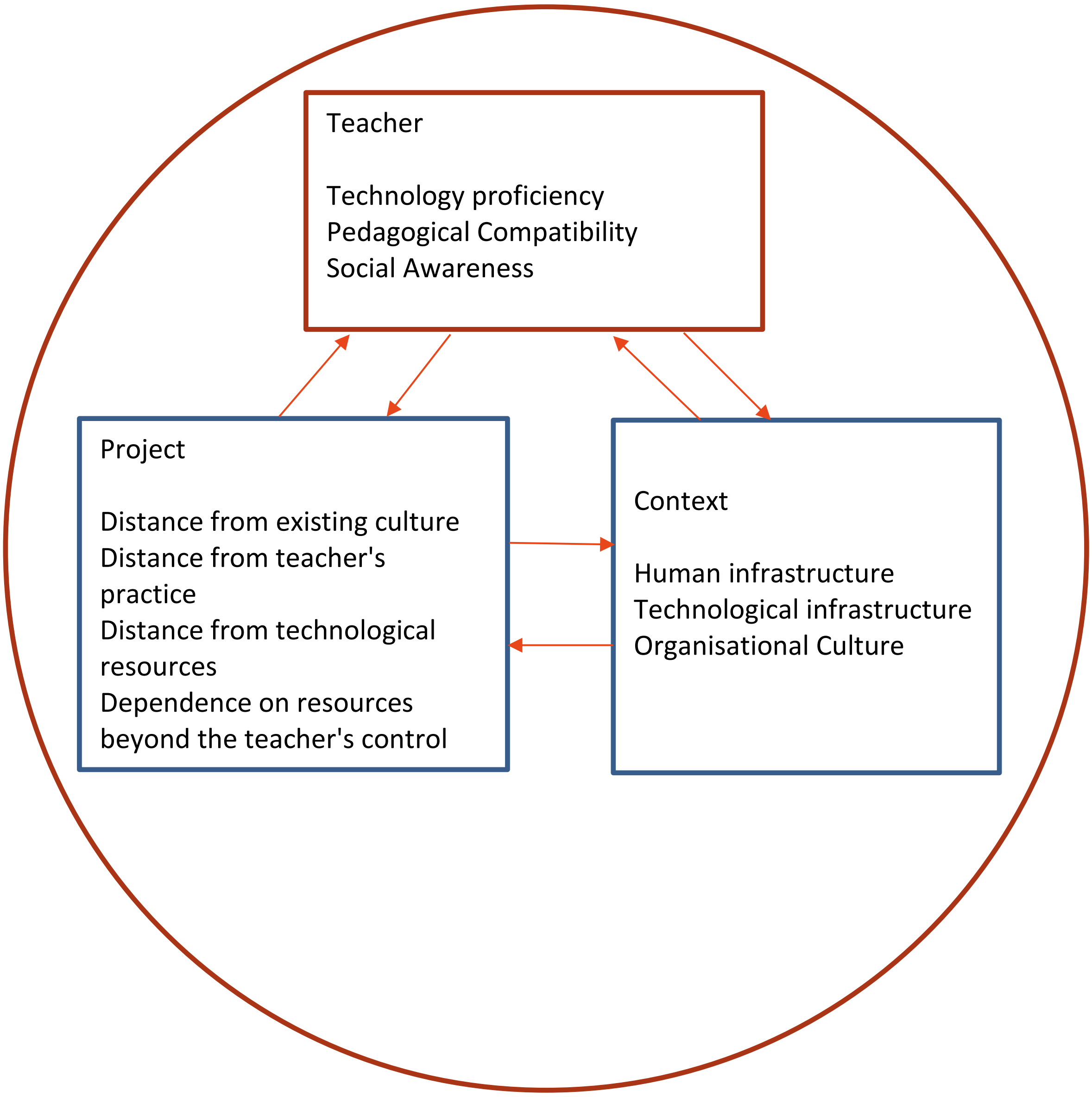

Figure 2.1: Conditions for Technology Innovations (Zhao et al., 2002).

Three factors associated with the teacher have been found to contribute significantly to the success of classroom technology integration: technology proficiency, pedagogical compatibility, and social awareness, see Fig 2.1.

Zhao et al. (2002) confirmed the assumption that a teacher's technology proficiency plays a significant role in classroom technology integration. Technology proficiency is not only deemed to be the ability to operate a piece of equipment or use a software application, but also knowing what is necessary to use a technology specifically in teaching. The factor is comparable to the first-order barriers identified by Ertmer (2005) as lack of training in technology and its use in classroom delivery that can act as a barrier to technology integration. The second factor discusses the compatibility of technology integration with the teacher's pedagogical beliefs. When a teacher's pedagogical approach to teaching was consistent with the technology, then the efforts to use technology were more likely to yield positive results. Pedagogical beliefs were identified by Ertmer (2005) as a second-order barrier the willingness to use technology could also be determined by self-efficacy another second-order barrier. Bandura (1995) stated that self-efficacy determined the effort applied and willingness to persevere in the face of setbacks, if the teacher had more confidence in technology use, then the outcome was more likely to be positive. The final factor in the teacher domain related to the social aspects or dynamics of the school, the type of support that was available and knowing where this support was available Ertmer (2005) identified all aspects of support as a first-order barrier whether this was technology support for equipment malfunction and failures or pedagogical support through technology champions or mentors.

There are two dimensions to the project domain, distance and dependence, see Fig 2.1. The distance domain refers to how much the project deviates from the status quo. Within distance are three sub-areas; distance from the existing culture, distance from existing practice and distance from available technological resources. The second dimension, dependence, refers to how much input is required from other people or resources, particularly people or resources that are beyond the innovator's immediate control.

Distance from the culture discusses how far the integration of technology deviates from the dominant set of values, pedagogical beliefs, and practices of the teachers and management. This domain stands comparison with second-order barriers related to teacher core beliefs. Distance from practice denotes the degree to which technology use differs from the prior educational practices and practical experiences of the teacher, once more a second-order barrier related to teacher pedagogy and self-efficacy. Distance from existing technological resources relates to the number of new technologies needed for successful completion of the project, this aspect in the study is not a significant barrier as resources are available although they are not unlimited and lack of resources or access to resources still exists as a first-order barrier.

Dependence on others refers to the degree that the integration requires the cooperation, participation, or support of people not under the individual teacher's authority. Support is a first-order barrier; in colleges, central technical support and training is not under the control of the teacher; therefore, it would be one of Ertmer's (1999) first-order barriers. Dependence on technological resources signifies the degree that the technology requires the use of resources beyond the control of the teacher. Although resources are available access to the resources remains beyond the control of individual teachers and is allocated by management, limited resources are still a first-order barrier (Ertmer, 2005).

The third domain, context, see Fig 2.1, has three aspects considered central to the success or failure of technology integration, these factors determine the context, and although not explicitly identified in the two-state Ertmer (1999) model some aspects are comparable. The factors are human infrastructure, technological infrastructure, and social support. Human infrastructure concerns the organizational planning to support technology integration in the classroom. Some of the factors associated with this include a flexible and responsive technical staff, and identifiable people who can help the teacher understand and use technologies for their own classroom needs, rather like the role of a "champion". Lack of support, in whatever role, was identified as potential first-order barriers by Ertmer (2005). The second aspect, the technological infrastructure, relates to the level of resources currently available to meet the needs of the project, Ertmer (2005) identified these as first-order barriers. When evaluating access to the available resources, these are determined by management based on criteria such as subject area and delivery or assessment requirements. The third aspect, the social support, refers to the extent to which peers support or discourage the project, this factor will be dependent on the culture of the college, and mainly determined by the beliefs and attitudes of the staff and management an identified second-order barrier (Ertmer, 2005).

2.4 Established Barriers.

Many of the types of barrier that exist to the integration of technology into teaching and learning have been acknowledged as extrinsic and are centred primarily on quantifiable facets, lack of resources, absence of non-specific training, poor technical support, lack of time, variable infrastructure, connectivity, bandwidth availability and technology reliability. Although there has been continued investment, extrinsic barriers continue to exist and remain a continued source of frustration. (Akcaoglu et al., 2015; Cárdenas-Claros & Oyanedel, 2015; Goktas, Gedik, & Baydas, 2013).

The integration of technology takes time to become effective, and it requires changes to move from teacher-centred to learner-centred approaches which cannot happen in the short term (Chandra & Mills, 2015). Even when teachers are enthusiastic about integrating technology, there remain many barriers to successful integration into teaching practices.

2.4.1 Barriers associated with Resources.

Successive U.K. governments have continued to invest in technology in education, and as a result many of the extrinsic first-order barriers (Ertmer, 2005) or deficiencies in technical infrastructure (Zhao et al., 2002) have been reduced, but not eliminated. Technology is now standard in classrooms across all sectors of education. There continues to be though shortages of technology or limited access to technology and this continues to be perceived as a barrier to integration (Plesch et al., 2013; Prestridge, 2012).

Colleges and individual teachers often allow students to use personal portable devices to supplement the lack of provision by the college, and this can create additional unintended barriers to technology integration. To supplement the lack of resources, students ostensibly use personal devices to access the internet or Virtual Learning Environment (VLE) during classes; nevertheless, many distractions have the potential to disrupt teaching and learning. It is difficult in these circumstances for teachers to monitor the students' activities when they are using their devices.

The most common activities not related to teaching and learning that students engage in during class time include texting, Facebook, tweeting, gaming, watching videos and online shopping among others (Kuznekoff & Titsworth, 2013). Portable devices can serve as a distraction when used in an uncontrolled and non-directed manner, constant connectivity results in a constant stream of distractions (Bellur, Nowak, & Hull, 2015; Fried, 2008). Despite student's beliefs that they have the self-efficacy to cope with this level of multi-tasking, the continual shifting of attention from work to non-work tasks distracts students from tasks requiring deep thinking. The continual shifting of task has been shown to have a more significant effect on lower-achieving students although, it impacts students of all abilities (Fried, 2008; Ravizza, Hambrick, & Fenn, 2014). The potential for student disengagement through these types of distractions acts as a barrier to technology integration, with teachers avoiding this potential disruption by avoiding and preventing the use of personal technology in the classroom (Heflin, Shewmaker, & Nguyen, 2017).

An unfavourable outcome of students using personal devices, without adequate monitoring or control, has been identified as “checking”. "Checking" is a new phenomenon for those that cannot seem to endure a day without repeated and regular access to mobile devices. *Checking* is checking for text messages, checking Facebook updates, checking emails, checking Twitter, checking web sites, and checking whether my friends are checking me.” (Goundar, 2014, p.212).

An additional unintended consequence of lack of resources in areas of low socioeconomic status that acts as a barrier to technology use in class is a situation known as the digital divide. The digital divide describes the unequal access to technology, computers and the Internet, which creates a gap between the “haves” and “have-nots.” Poor, less able or disadvantaged students are less likely to have equal access to technology, this has a knock-on effect on their ability to learn and develop (Hohlfeld, Ritzhaupt, Dawson, & Wilson, 2017). Teachers faced with this situation avoid integration of technology for reasons including avoiding embarrassment for the individuals that do not have personal devices as well as maintaining equality within the classes (Clayton & Macdonald, 2013; Zhang, 2014).

2.4.2 The Absence of or non-specific Training.

While it is possible to recognise the effectiveness of technology when teachers have a positive attitude towards using the technology, an essential determinant in teachers adopting technology is the training they have received relating to its use specifically for teaching purposes. This lack of specific training can manifest itself as a barrier to technology integration into classroom practice (Donnelly, McGarr, & O’Reilly, 2011; Keengwe, Onchwari, & Wachira, 2008; Prestridge, 2012).

With the continual development of technology and the expectation of integration into education by policymakers, computer anxiety among teachers, created by lack of training and self-efficacy, has been identified as a barrier to achieving integration (Celik & Yesilyurt, 2013). When training is limited or not specific in how to use technology for teaching and learning purposes, it acts as a barrier (Al-Senaidi, Lin, & Poirot, 2009; Lee & Tsai, 2010).

Zhao et al. (2002) identified this type of barrier being associated with human infrastructure and teacher proficiency while Ertmer (2005) considered this to be a first-order barrier, in this context training is deemed to be a tangible, quantifiable factor. According to Jones (2004), in a review of research literature commissioned by the British Educational Communications and Technology Agency (BECTA), teachers feel reluctant to use computers if they lack confidence. “Fear of failure” and “lack of technology knowledge” have been cited as some of the reasons for teachers' lack of confidence in adopting and integrating technology into their teaching (Balanskat & Bleamir, 2007).

Previous studies concluded that proficiency in using technology in general, using word processing, email and browsing the web, is not a reliable indicator that technology will be used in the context of teaching and learning (Lau & Yuen, 2013; Messina & Tabone, 2013; Shawer, 2013). Technology integration is dependent primarily on the perspective of the teacher. Shin (2015) suggested that most teachers decide the level of integration, but as policy is determined mainly at management and even government level, teachers' feel that they are obliged to engage.

The level of engagement varies with many teachers continuing to use technology for convenience rather than any fundamental change to classroom practices, although the medium of delivery has transformed, from the blackboard to a flip chart, to a whiteboard or a computer screen in the form of Power-point or similar presentations delivery methods remain unchanged.

Fundamentally teaching styles remain whatever the teachers are familiar and comfortable using (Akcaoglu et al*.,* 2015; Shin, 2015). Even when teachers have a positive attitude and possess the level of training and knowledge to integrate technology, there are factors beyond their control, and lack of technical support inhibits the integration of technology.

2.4.3 Lack of Technical Support.

Recurring technical faults and equipment malfunctions lead to lower levels of technology use by teachers. Technology failures, or the expectation of failures occurring during lessons, are likely to reduce teacher confidence and cause teachers to avoid using the technology in future lessons (Jones, 2004). A lack of technical support in colleges can results in routine technical maintenance and software upgrades impacting on the serviceability and availability of technology when required (Jones, 2004; Buabeng-Andoh, 2012).

Zhao et al. (2002) identified this type of barrier as being in the social aspects of the teacher domain, being able to identify the type and location of the support available and within the dependence aspect of the project domain, dependence on the cooperation, participation, or support of people not under the innovator's authority, Ertmer (2005) considered lack of support to be a first-order barrier.

Technical problems results in loss of time, interrupting the delivery and flow of classroom activities and demotivates both students and teachers (Jones, 2004; Bingimlas, 2009; Korte & Husing, 2007). When teachers, with limited expertise and experience in using technology in classroom practices, are unable to accomplish a task, they often shun these situations and avoid using technology (Snoeyink & Ertmer, 2001). The lack of available technical support is likely to lead to teachers avoiding technology, for fear of a fault occurring and lessons being unsuccessful as a result (Jones, 2004). Lack of technical support is easy to identify; lack of pedagogical support is more difficult to identify or quantify as it is intrinsic and individual.

2.4.4 Absence of Pedagogical Support.

Pedagogical beliefs are formed from experiences over many years, beginning as a pupil in school (Keys, 2007; Richardson, 2003) and continuing through a variety of professional contexts faced by teachers. A lack of support from dedicated, specialized staff experienced in integrating and using educational technologies in different subject areas, that are capable of supporting different pedagogical styles can lead to lost teaching time, teacher and learner frustration and the eventual abandonment of technology (Akcaoglu et al*.,* 2015; Cárdenas-Claros & Oyanedel, 2015; Goktas et al*.,* 2013). There appears to be an assumption as presented by Zhao et al. (2002) that all that was needed by teachers was “some technical skills and a good attitude”. The lack of specific support in the use of technology in the classroom for teaching and learning coupled with the inability of teachers to identify and implement effective digital pedagogies has acted as a barrier to the effective integration of technology (Scrimshaw, 2004).

Zhao et al. (2002) considered this type of barrier as being within the realms of all three domains, within the teacher domain it suggested compatibility with the teacher’s pedagogical beliefs, but it was also reflected within the project domain as the distance the project deviates from the dominant set of values, pedagogical beliefs, and practices of the teachers and management. Another aspect of distance, distance from practice, refers to the degree to which a project differs from the prior educational practices and practical experiences of the teacher. Within the context domain it signified human infrastructure as a potential barrier to integration of technology referring to factors including flexible, responsive and identifiable people who can help the teacher understand and use technologies for their own classroom needs. This help is rather like the role of a “champion”, who could provide support on an individual basis. Ertmer (2005) identified pedagogical beliefs as a second-order barrier. The factor of distance from the culture in the project domain stands comparison with second-order barriers related to teacher core beliefs incorporating teacher pedagogy and self-efficacy.

The assumptions identified by Zhao et al. (2002) earlier contribute to a perception among teachers that there is a general lack of pedagogical support and training in the effective integration of technology into teaching and delivery. It has been suggested that eighty hours of specific continued professional development (CPD) is required before teachers can begin to integrate technology effectively into their teaching according to Carlson and Gadio (2002), while Marcinkiewicz (1993) suggests that it will take five to six years before teachers can fully acquire the expertise to use technology in the ways advocated and move to a constructivist student-centred classroom environment. Despite governments and educational institutions endeavouring to provide students with better learning environments by investing heavily in the procurement of computer hardware and technology (Türel & Johnson, 2012) the scarcity of support and time to integrate technology effectively has resulted in the situation remaining largely unchanged.

2.4.5 Shortage of Time.

Contracts for teaching staff in Further Education equate routinely to twenty-five hours of contact time per week on a full-time contract. In addition to this, they have other duties including preparation, marking, mentoring, counselling, as well as CPD and meetings of various types (Feather, 2017; Tummons, Orr, & Atkins, 2013). Parry et al. (2009) suggested that due to this level of contact time students become more dependent on teachers. The integration of technology has added to the workload of teachers, and these additional duties include, converting teaching materials to a format compatible with the technology used, course maintenance and upgrades associated with the VLE, responding to student emails and the need to learn new skills (Samarawickrema & Stacey, 2007). Many teachers feel overwhelmed by the constant and increasing demands on their time with an already overcrowded curriculum and substantial teaching commitments another demand in the form of this additional work and training is pushing teachers to the limit and in some cases beyond (Neyland, 2011; Waite, 2004) this acts as a barrier to technology integration.

Changes in managerial practices and increased external pressure has led to an intensification of work to reduce labour costs leading to the view that lecturers are now regarded as more akin to production operatives (Feather, 2010; Mather et al., 2007). Prior research concludes that teachers are unable to find time to be able to use or explore the potential of the technology considering the intensity of the curriculum as well as a perceived lack of support (Waite, 2004). Performance-based management systems and a culture of internal and external auditing has added to teacher’s workload with constant demands for information which is considered a normal function of the role of teachers (Bailey & Colley, 2015). As a result of these demands, teachers are working consistently over hours, with work spilling over into personal time, including holidays (Avis et al., 2001; Jephcote et al., 2008).

2.4.6 Infra-structure related barriers.

While the government has continued to support the provision of technology in schools and colleges, (Association of Colleges, 2019; De Witte & Rogge, 2014; Nagel, 2014), there continues to be fundamental challenges regarding the delivery and reliability of internet and broadband services that are essential for the integration of technology into education as in all other areas of modern life. People in some areas are at risk of being left behind because of inadequate access, and the government's focus should be on providing reliable, consistent broadband connectivity rather than download speeds that will vary depending on the demand at different times of the day (The House of Lords Select Committee on Communications, 2013). In an educational environment, infra-structure reliability is considered essential, and when technology fails due to unreliability or poor connectivity, this acts as a barrier to integration. Teachers stay with the reliable methods that they know will work rather than risk the potential disruption caused by technology malfunctions.

Many of the barriers discussed in this section, being extrinsic, are to a greater or lesser extent measurable and through procurement and investment can be reduced or minimized. Much harder to address and impossible to measure are the intrinsic barriers, the beliefs of teachers that are fluid and prone to change depending on the context or situation teachers face, and teacher self-efficacy or self-confidence in using technology. Despite the continued investment and provision of technology, there remains deep-seated barriers and suspicion related to the use of technology in teaching and learning. Additionally, second-order barriers need to be addressed before teachers will be able to integrate technology as policymakers envisage.

2.4.7. Intrinsic barriers.

More significant than the first-order barriers are the second-order barriers, identified as the ‘real gate-keepers’ to the integration of technology. Second-order barriers are intrinsic, embracing the core values that teachers have and often concern the beliefs and attitudes that are central to what constitutes teaching and how this is achieved. Self-efficacy is another second-order barrier that can have a significant influence as to whether teachers will even attempt to integrate technology into their teaching practices. Within these barriers are the personal beliefs and attitudes of teachers and the degree of change required in teacher’s understanding and beliefs to integrate technology. These barriers provide more of a challenge to address as they are individual, personal and liable to inexplicable change (Blackwell et al., 2013; Ertmer & Ottenbreit-Leftwich 2013; Howard, 2013).

The integration of technology is far more complicated than the perspective stating that all that was needed by teachers was “some technical skills and a good attitude” (Zhao et al., 2002, p.511). Teachers do use technology for familiar tasks within their personal and working lives. As much of the training and CPD focuses on computer use and neglects how to effectively use technology to teach students barriers develop associated with using technology for instructional purposes (Bingimlas, 2009; Prestridge 2012; Wiseman & Anderson, 2012). Moreover, the fundamental pedagogical beliefs of teachers will determine the style of teaching that they adopt in the delivery of classes (Bandura, 1986; Clark & Peterson, 1986).

There is a belief that teachers teach the way they were taught, but perhaps a better interpretation is that teachers teach the way that they learn (Dunn & Dunn, 1979). It is, therefore, conceivable that teachers continue using these methods as they believe them to be easy or correct. This perseverance could explain why teachers are reluctant to dispense with what is familiar and embrace what may be uncomfortable, thereby building barriers to the introduction of technology into their teaching (Dunn & Dunn, 1979). There is an argument that most reforms are unsuccessful because they fail to take teachers’ existing knowledge, perceptions, attitudes and beliefs into consideration when educational changes are imposed in a top-down manner (Van Driel, Beijaard, & Verloop, 2001).

2.4.8 Teacher self-efficacy in using technology.

Bandura (1995, p.3) defined self-efficacy as “the belief in one’s capabilities to organize and execute the courses of action required to manage prospective situations” or “the belief that one has the necessary skills and abilities to perform the behaviour" (DiClemente, Crosby, & Kegler, 2009, p.218). Self-efficacy theory reflected the belief that certain behaviours will lead to specific outcomes, confidence that the behaviour can be successfully performed in the first instance and shows the individual’s expectation of personal success (Bandura, 1977, 1982; Maddux, Sherer, & Rogers, 1982).

Technology has become an indispensable part of modern living and an inseparable part of daily life. The developments within technology has led to the widespread desire for the integration of technology into education. With the continual development of technology and desire for integration by management and policymakers has led to increased anxiety among some teachers. Jones (2004) reported “many teachers who do not consider themselves to be well skilled in using technology feel anxious about using it in front of a class of children who perhaps know more than they do” Jones (2004, p.7; Betoret, 2006). A study of 82 teachers with several years teaching experience concluded that perhaps some of this anxiety exhibited by teachers is down to the lack of training and resultant lack of efficacy in the use of technology in the delivery of teaching (Balanskat & Bleamir, 2007).

Research on teacher self-efficacy in technology integration and use has focused on specific clearly defined areas and contexts across many different geographical areas (Banas & York, 2018; Celik & Yesilyirt, 2013; Tweed, 2013) and provide a snapshot of some of the research studies that have indicated that teacher self-efficacy is a valid indicator of technology use in the classroom (Kavanoz, Yuksel, & Ozcan, 2015).

The perceived ease of use of the technology, teacher’s attitude to the contribution technology can make as well as the professional development and support teachers received are contributing factors affecting integration, (Kerckaert, Vanderlinde, & van Braak, 2015; Li, Li, & Franklin, 2016; Oddone, 2016).

2.4.9 Teacher Core Beliefs.

Policymakers and government actively promote the belief that teaching is undergoing an evolutionary change, shifting decidedly from a teacher-centred to a student-centred activity. In practice, established curricula and teaching approaches remain virtually unchanged with technology being underused and poorly integrated into the classroom (Akcaoglu et al*.,* 2015; Shin, 2015). Teachers form their own beliefs about the role and contribution technology can make as a teaching tool and the value that it can offer to students in terms of learning outcomes. These beliefs intersect with teachers' established beliefs about pedagogy, and as Prestridge (2012) concluded, can be a point of 'collision' or 'collusion'. Technology is viewed either as an add-on to established practices, or as a means of accomplishing real change in practices. Whatever views the teacher holds, they are likely to be reflected in the practices and beliefs about teaching and learning.

The methods employed by teachers will depend on their view of how learning is achieved (Conole, Dyke, Oliver & Seale, 2004; Trigwell & Prosser, 1996). When teachers view learning as the accumulation of knowledge to meet external requirements, there is a tendency to focus on the transmission of information, learning in this context becomes more surface learning to achieve a specific outcome. Conversely learning viewed from the perspective of student growth and development means teaching becomes more student-centred with deeper and more sustained learning (Prosser & Trigwell, 1998). To change the way that teachers approach their teaching, they need to change the way they conceive learning and consequently teaching (Marton & Säljö, 1997; Trigwell & Prosser, 1996).

"Research offers little support for the popular (though perhaps unrealistic) rhetoric about technology revolutionizing teaching." (Hennessy, Ruthven, & Brindley*,* 2005 p.156; Liu, 2013; Underwood & Dillon, 2011). Technology primarily remains viewed as a useful tool that is used to support traditional teaching approaches (Ertmer & Ottenbreit-Leftwich, 2013; Hernández-Ramos et al., 2014). Liu (2011) maintained that 80% of teachers use lecture-based teaching with technology while others demonstrated that teachers preferred to use traditional teaching methods (Plesch et al., 2013; Scherer, Siddiq, & Teo, 2015). Whether this is due to teachers reticence and resistance, (Howard, 2013; Selwyn, Dawes, & Mercer; 2001) or based on caution and practical experiences (Donnelly et al*.,* 2011; Prestridge, 2012) there is clearly a failure to acknowledge the degree of change in teacher's beliefs that is required (Ertmer & Ottenbreit-Leftwich, 2013; Hennessy et al*.,* 2005; Pierce & Ball, 2009).

Trying to define teacher beliefs is a complex and often confusing exercise (Etrmer 2005; Prestridge, 2012). Teacher's beliefs are not immediately identifiable, consistent or quantifiable being based often on experience and emotions. Beliefs often shape teacher perceptions of what constitutes teaching and are linked to their experiences as students as well as the context in which they operate. (Hansen & Stephens, 2000; Joram & Gabriele, 1998; Lofstrom & Poom-Valickis, 2013). Beliefs are far more influential than knowledge in manipulating behaviour (Griffin & Ohlsson, 2001).

A widespread perception has developed regarding teacher resistance, whether curriculum change in the UK (Birchley, 2013) restructuring and league tables in New Zealand, (Mutch, 2012) or the introduction of ICT in the US and many other countries (Cuban, 2011). Advocates of technology integration opine that teachers are the major obstacle and barrier to the smooth integration, (Chandra & Mills, 2015; Hu & McGrath, 2011; Sipila, 2013) while powerful and influential organizations, operating from a position of self-interest and shareholder obligation, consider it time to re-design outmoded learning environments to make them more relevant to a new generation of students (Apple, 2008).

To counter this viewpoint sceptics argue that their caution is justified and teachers understand the operational practicalities of life in the classroom, while "teacher resistance" is a convenient label attached to teacher's reservations and professional misgivings by others, who do not understand the classroom realities (Hernández-Ramos et al*.,* 2014). Cuban (2011) illustrated the difficulties when he stated that policymakers determine change based on "criteria of *organizational* effectiveness, efficiency, and equity. Teachers accept, modify, and reject innovations on similar criteria, but with the focus on *students* and *classrooms*."

As Csikszentmihalyi (1995) determined, there must be compelling reasons for others to adopt new ideas, tools or practices and those reasons are that they are more powerful or easier to use. Prior research indicates that technology has yet to reach its full potential in the classroom and the widescale revolution in practice remains as elusive as ever (Hernández-Ramos et al., 2014; Sipila, 2010; Underwood & Dillon, 2011). Teachers use technology, however, despite technological advances these activities are usually confined to tasks that they are comfortable with (Bouwman, Carlsson, Molina-Castillo, & Walden, 2007; Chen, 2008; Hernández-Ramos et al., 2014). Remaining within this comfort zone may be indicative of some of the reluctance to adopt technology in the classroom, there is also a known dip in performance identified in national testing experienced after technology integration (Somekh et al., 2004) and this may reinforce teacher's reluctance to adopt technology in the classroom.

Regardless of the benefits of technology-supported education, there needs to be a specific and targeted programme of development and training to overcome the intrinsic barriers of self-efficacy and address the changes needed to teacher's core beliefs. The level of training and development provided to teachers in how to use computers in teaching practices remains limited, and many are unable to use technology for teaching and learning purposes (Al-Senaidi et al., 2009; Lee & Tsai, 2010). There are significant changes required to embed technology in the educational infrastructure associated with teacher training, curriculum structures and materials, classroom practices and modes of assessment at all levels (Livingstone, 2012).

Discarding the familiar and adopting the unfamiliar might be overly ambitious in the “general risk aversion [environment] in teaching” (Howard, 2013, p.357), technology will only be adopted when there is a clear benefit to teachers from using it. Zhao et al. (2002) stated that “when teachers’ beliefs conflicted with the technology … they struggled to successfully accomplish the goals of the project” Zhao et al. (2002 p. 492).

2.5 Technology Adoption Models.

Rogers (2003) classified in the *Diffusion of Innovations* several factors that would need to be of benefit for any innovation to be adopted, these related to economic advantage, convenience and ease of use as well as compatibility with existing values and practices. Teachers need to be convinced that there is a tangible benefit for them from integrating technology into the classroom for them to use it (Hernández-Ramos et al*.,* 2014; Scherer et al*.*, 2015; Tondeur et al*.,* 2008).

The Technology Adoption Model is one of the most cited models (MacCallum, Jefferies, & Kinshuk, 2014), the model suggests that there are several contributing factors that will determine whether an individual will adopt a particular technology, among them are, attitudes, (Straub, 2009) ease of use and perceived usefulness, (Saadé & Kira, 2007) and improved results (Brown, Venkatesh, & Goyal, 2012).

Earlier research into teacher education determined that not only was it necessary for teachers to possess in-depth subject matter knowledge, but they should also possess pedagogical knowledge which was crucial to good teaching and understanding (PCK) (Feiman-Nemser & Buchmann, 1987; Shulman, 1986, 1987; Tobin & Garnett, 1988).

Mishra and Koehler (2006) extended the work of Shulman to incorporate technology and developed the Technological, Pedagogical, Content Knowledge (TPACK) framework. Teachers' understanding of educational technology interact with Pedagogical Content Knowledge to deliver effective teaching using technology. There is a tendency to focus on the technology and not on how to use the technology in teaching (Mishra & Koehler, 2006). The focus of much of the training associated with technology for teachers has been on the transmission and acquisition of technological skills, rather than on the effective use of technology to enhance student learning (Chen, 2008; Daly, Pachler, & Pelletier, 2009; Gorder, 2008; Liu, 2013).

Teacher's understanding of educational technology is a vital component in association with Pedagogical Content Knowledge to deliver effective teaching using technology. Studies have been unable to establish any particular characteristics or demographics that are more or less reluctant to integrate and use technology (Kerckaert et al*.,* 2015; Scherer & Siddiq, 2015; Tweed, 2013). However, despite the best efforts of government, policymakers, management and teachers "In practice, established curricula and teaching methods remain in place under a thin coating of technological glitter, and available technology is often underused and poorly integrated into classroom practice." (Hennessy et al*.,* 2005 p.159).

2.6 Development of the Research Questions.

When reviewing the literature and developing the research questions, it was essential to review some of the aspects of teaching and learning literature that underpinned the study and were felt to be relevant to the Further and Vocational Education sector (section 2.2.3). Within the Further/Vocational Education sector, different teaching strategies are used by teachers' dependent upon the context and environment faced as well as the content and curriculum to be delivered (section 2.2.2). Further and Vocational Education provides opportunities for teachers and practitioners to adopt a variety of approaches to teaching and context is of vital importance (Harkin, 2005; Lucas & Nasta, 2010).

The Further/Vocational Educational sector is an under-researched area and being familiar to me as a practitioner, was of specific interest resulting in the research study. From my understanding of the sector and from working within it, it appeared to operate within a unique context (section 2.2.2). Teachers and tutors within the sector may not have followed what could be considered a traditional route into teaching, with teachers and tutors having gained a wide range of industry experience within a precise discipline or field before they entered the field of education. It was necessary to investigate, through the literature, the characteristics and profiles of teachers in Further/Vocational Education to try to determine if there were any distinct traits or characteristics that existed (section 2.2.2).

Until 2007 there was no requirement for teachers in Further/Vocational Education to have undertaken or achieved a formal teaching qualification as industry experience, and professional qualifications were deemed to be more relevant (section 2.2.2). When examining why teachers did not integrate technology into their teaching practice, one of the main barriers established from the literature was that of efficacy in using technology within the classroom. The concept of barriers was introduced in section 2.3.2 and featured in more detail in a later section 2.4.8 when reviewing the literature around self-efficacy. There are teachers engaged in Further/Vocational Education that do not possess any formal teaching qualification either because they were teaching before or engaged after this date on the basis that they achieve a teaching qualification after engagement. I felt that it was necessary, therefore, to examine the literature around self-efficacy in section 2.4.8.

From the review of the literature outlined above, I developed research questions one:

1. How do teachers in Further/Vocational Education use and integrate technology into their teaching practice?

The main area of research was to investigate teacher's beliefs and attitudes in their teaching practice towards the use and integration of technology in Further and Vocational education colleges. Much of the previous research has established the existence of barriers these barriers defined as first-order barriers, are deemed to be extrinsic in nature and measurable (section 2.4) and second-order barriers that are more intrinsic and liable to change and vary depending on the context or situation that exists (section 2.4.7). The research identifying barriers was mostly from schools, and as a result, a gap exists in the types and barriers that exist in the Further/Vocational Education sector. The investigation of the existence of barriers to the integration of technology led to the second research question:

2. What barriers and facilitators exist to inhibit or support the use of technology in Further/ Vocational Education?

The final research question presented was to examine the beliefs of the teachers concerning the integration of technology into their teaching practice. The perceptions of teachers toward technology and the perceptions of others to teachers was examined. There was also a review of literature around the area of technology adoption models that examined the constituent parts that were necessary for the effective adoption of technology and a recognition of the fundamental change that was necessary for teachers to integrate technology effectively. The literature highlighted that constant change or innovation often left teachers feeling overwhelmed by change while not always receiving the necessary support and training that would enable them to move from a position of teaching students about technology to one of teaching students with technology. Research question three examined the area of teacher beliefs and attitudes about technology integration

3. What are the teacher's beliefs concerning the integration and contribution technology can make to their teaching in Further/Vocational Education?

Chapter 3 Methodology and design.

3.1 Introduction.

This chapter details the philosophical and theoretical underpinnings of the research methodology and design. The section begins by outlining the research philosophy, epistemological and ontological considerations that are relative to the research study. The design employed and the rationale for using it will be detailed. Full details of the recruitment of participants, the sample selection process, methods of data collection and analysis and ethical considerations surrounding the study are set out.

3.2 The philosophical and theoretical underpinnings of the research project.

3.2.1 Theoretical stances and positions.

Crotty states that the terminology used in research literature is baffling with epistemologies, ontologies, theoretical perspectives, methodologies, and methods "thrown together in grab-bag style as if they were all comparable terms" (Crotty, 1998 p.3). It is easy to conclude that these terms signify some hierarchical levels of decision making within the research design process, but the overarching concern must be the evidence obtained answers the research question posed no matter what label is ascribed to them (De Vaus, 2011). It is also imperative that there is recognition that "a researcher's background and position will affect what they choose to investigate, the angle of investigation, the methods judged most adequate for this purpose, the findings considered most appropriate, and the framing and communication of conclusions" (Malterud, 2001, pp. 483-484).

When deciding on a research philosophy, there are two theoretical concepts to be considered, although Crotty contends that these, epistemology and ontology, are mutually dependent and therefore difficult to examine or discuss in isolation. They intersect, "to talk about construction of meaning is to talk of the construction of a meaningful reality" (Crotty 1998, p. 10). There are also important taken for granted assumptions about how individual researchers view the world. These assumptions underpin the entire research strategy and methods employed. A researcher needs to be aware of them since they will impact on the research study (Saunders, Lewis, & Thornhill, 2009). Recognising these assumptions and the positions adopted are vital, and the positions adopted, and stances taken have been stated throughout. The first concept ontology is concerned with the nature of reality and questions associated with how the world operates.

3.2.1.1 Ontology.

Ontological assumptions are concerned with what we believe constitutes social reality (Blaikie, 2000, p. 8), and is associated with a central question of whether social entities, such as culture, should be perceived as objective or subjective. Objectivism asserts that social phenomena and their meanings have an existence that is independent of social actors'. Subjectivism/Constructivism asserts that social phenomena, and their meanings, are continually being created from the perceptions and actions of social actors and suggests that social phenomena are not only produced through social interaction, but are constantly revised and modified (Bryman, 2015). I am primarily a constructivist in the way that I view the world. I deem that social phenomena and categories are the product of social interaction and continuously in a state of flux. The study focuses primarily on the perceptions of teachers regarding the barriers and enablers they are faced with when using and integrating technology in their professional lives. These barriers are often socially constructed and are personal based on experiences, the constructivist stance that I hold, therefore supported the study. The second theoretical concept to examine is epistemology and concerns what constitutes knowledge in a field of study.

3.2.1.2 Epistemology.

Epistemology involves the theory of knowledge and claims about how what is assumed to exist can be known (Blaikie, 2000, p. 8). Epistemology focuses on the knowledge gathering process and is concerned with developing new models or theories; knowledge is deemed to be continually changing (Grix, 2002). Within epistemology, there are two different positions 'positivism' and 'interpretivism'. Positivism adheres to the prevailing view that real knowledge is the result of observation and measurement. The role of the researcher is limited to data collection and objective interpretation, resulting in quantifiable findings capable of statistical analyses. Interpretivism integrates human interest whereby researchers interpret elements of the study. Interpretivism contends that reality is only achieved through social constructions such as language and shared meanings and acknowledges the differences between people and objects, requiring the researcher to grasp the subjective meaning behind social actions (Bryman, 2015; Myers, 2013). The study focused on examining the perceptions of the participants from the individual's perspective; the researcher interpreted the subjective meaning behind the social constructions presented by each participant. An interpretivist epistemology, therefore, underpins the current study as it sought to explore perceptions and beliefs of individual the teachers regarding the integration and use of technology in their professional lives.

The epistemological assumptions of interpretivism are that social reality is individual and multiple people interpreting an event will result in multiple perspectives of an incident. (Chandra & Mills, 2015; Howard, 2013; Yang, 2012). Interprteivist studies have had questions raised over reliability, but others take the view that these different ways of seeing the issue provide a richer, more developed understanding of complex situations (Malterud, 2001).

A standard method for achieving this, according to Crotty (1998) is to use and collect data via unstructured interviews in which only open-ended questions are asked (section 3.4.7). This method was employed in the current study. Semi-structured interviews with open-ended questions were used to examine the perceptions and beliefs of teachers through their own experiences; this way, themes emerged from the data. Semi-structured interviews rather than unstructured interviews were appropriate due to the constraints of time and availability of participants for interview purpose. They also limited the quantity of data generated for analysis and transcription purposes as well as prevented interviews drifting off-topic and becoming rambling conversations failing to address the research topic, and this is one possible outcome from using unstructured interviews (Bryman, 2015; Coolican, 2013; Mears, 2012).

Many influences will determine the position adopted by a researcher when undertaking any research study, experiences and character as well as background and perceptions will all contribute to the ontological and epistemological position held and adopted by the researcher (Malterud, 2001). Another aspect of the position occupied by the researcher that could impact and influence the research study is reflexivity.

3.2.1.3 Reflexivity.

Reflexivity is a recognition that a researcher cannot divorce themselves from their personal feelings, reactions and motives when conducting a research study and these may influence and affect what they think in particular contexts throughout the research process. Different researchers will approach a situation from different positions or perspectives, this could lead to a different, though equally valid, interpretation of the same situation under investigation by different researchers. As Malterud contends "Preconceptions are not the same as bias, unless the researcher fails to mention them" (2001, p. 484) Having worked in the F.E. sector and faced the situation first-hand, both as a teacher and a manager within a college, inevitably I held preconceived ideas concerning the perceived barriers faced by teachers regarding technology integration into teaching practices, these ideas formed during discussions with colleagues in colleges. To maintain credibility, qualitative researchers need to identify their role due to the direct and detailed role that they occupy during both data collection and data analysis phases where researcher membership in the group or area studied has greater relevance (Dwyer & Buckle, 2009).

3.2.1.4 Summary and researcher position.

The research philosophies defined as ontology and epistemology, and the alternative stances within them, are often depicted as being binary in nature although there is no particular stance that is better than the other, they are selected based on the assumptions made by the researcher and how the world is viewed (Duberley, Johnson & Cassell, 2012). The subjective nature of the study and the framing of the research questions, as well as the personal beliefs and assumptions held by the researcher, have formulated a study that will be from an epistemological stance interpretivist, and an ontological position of subjectivist/constructivist. Investigating and examining teacher's perceptions and beliefs regarding the barriers and enablers that exist for them in integrating technology into their teaching practice and the contribution and usefulness of technology in their teaching, are personal and subjective and fits with the philosophies identified and stated earlier.

It must be recognised and accepted that I have preconceived beliefs and attitudes established through experience and background, not just confined to the area of study. Individuals are constructed by the world while at the same time constructing the world through our backgrounds and experiences (Laverty, 2003). Heidegger, cited in Polkinghorne (1983), emphasized the importance of history and background on a person's understanding of the world by providing a reference for what is considered real and my personal opinions and beliefs will influence any decisions taken. What was of interest was building a total picture from the partial accounts of the teachers based on their experiences, recording the way things appeared to them and reporting any consistent themes that emerged. I wanted to collect and analyse data about their experience while recognising the subjective nature of their responses.

3.2.1.5 Insider or Outsider.

Merton (1972), classified two opposing views as the Outsider and Insider Doctrines. The Outsider Doctrine values researchers who are not from the communities they study, they are neutral, detached observers. The Outsider Doctrine questions the ability of insider researchers to analyse, in a detached, objective manner, when they are an integral part of it. The Insider Doctrine conversely disputes the ability of outsider researchers to understand the culture or context fully as they have no experience of it directly (Kerstetter, 2012).

Dwyer and Buckle (2009) challenge the notion of binary positioning of insider and outsider status. The proposition was that there are a few characteristics of a researcher that will remain consistent throughout the research process, but there are few cases in which researchers remain complete insiders or outsiders. Their identities often change along a spectrum between these binary positions dependent on the context, location, personality of the researcher and participants and the research subject (Dwyer & Buckle 2009; Kerstetter, 2012; Mercer, 2007).

3.2.1.6 The Inbetweenie.

I feel as the researcher that I occupy the space in-between the insider and outsider researcher. I based this assertion on the fact that I worked for many years as a teacher in the Further and Vocational Education Sector both in the U.K. where I trained, and abroad where I went initially as a teacher and then progressed to become a manager and vice-principle of a college. I have first-hand knowledge and experience of the work, environment and context of colleges in these locations from a teacher's perspective and a manager's perspective. I faced the same questions that formed the basis of the study as a teacher and have asked those same questions as a manager in a college; this background allowed me to consider myself as a partial insider researcher. Since I left the U.K. in 2008, there have been many changes within the sector, the requirement for teachers to hold a formal teaching qualification that was implemented in 2007 being an example of just one. Working practices and the role of teachers in Further and Vocational Education had changed significantly from when I taught in the U.K., and I must, therefore, consider myself to be something of an outsider researcher, but not a complete one.

3.3 Approaches to Data collection.

3.3.1 Qualitative Research.

Qualitative research is associated broadly with the interpretivist/constructivist paradigm emphasising the individual construction of meaning of the world through the subjective assessment of attitudes, perceptions, experiences and behaviour of the research participants (Mack, 2010). Qualitative research techniques were used during the interview process of the study, although participants were also invited to complete two preliminary online surveys to collect background data and build a picture of the teachers taking part in the study.

3.3.2 Quantitative Research.

Quantitative research is primarily viewed from a positivist perspective of the social world and studied according to the principles and procedures of the natural sciences. Positivist research has an emphasis on scientific methods, statistical analysis and generalizable findings. Auguste Comte, the founder of positivism, believed reality could be observed (Mack, 2010). Positivist researchers maintain that the scientist is the observer of an objective reality (Underwood & Dillon, 2011). Quantitative data was collected during the Phase 1 survey to establish a background profile of participants and used for comparison purposes with the Education and Training Foundation 2017 Report to confirm that the sample was consistent with the sector overall. The data was analysed using IBM Statistical Package for the Social Sciences (SPSS) to establish any statistical significance between dependent and independent variables. The dependent variables were associated with, teacher's confidence in using technology, the frequency and type of engagement that teachers had with technology, perceived barriers that existed to the integration and use of technology and CPD or training that had been offered or undertaken. The independent variables used were Age, Subject Area, and Teaching Experience.

3.3.3 Mixed Methods Research.

Mixed methods research involves blending the philosophical assumptions concerning the fundamental questions of ontology, epistemology and theoretical perspective and deciding that a combination of these approaches will best suit the research process and answer the questions posed. Mixed method research uses quantitative and qualitative data collection techniques and analysis procedures, but does not combine them (Sadaf, Newby & Ertmer, 2012). Quantitative data are analysed quantitatively, and qualitative data are analysed qualitatively (Creswell & Plano Clark, 2007; Saunders et al*.,* 2009). The fundamental premise is that the use of quantitative and qualitative approaches, in combination, provides a better understanding of research problems than either approach alone (Haydn, 2014; Hu & McGrath, 2011). When deciding on the approach to be used for data collection is was necessary to evaluate the different methods outlined above and determine what I considered to be the best fit for the study.

3.3.4 Theoretical perspective and Epistemological Considerations.

I initially approached the study intending to use mixed methods, combining both a qualitative and a quantitative perspective, a method previously used by Prestridge (2012), Sadaf, *et al.* (2012) and Eteokleous (2008). There have been arguments against using mixed methods based on the belief that research paradigms are incompatible and inextricably linked to epistemological assumptions, values and methods (Lincoln & Guba, 1985). However, as Bryman (2015) stated, research methods are much more compatible than is often supposed, with methods associated with both quantitative and qualitative research being employed together in a single piece of research.

The purpose of the first of two online surveys was for initial data gathering and identification of themes that would support the development of the interview schedule and the second survey to give an insight into the teachers participating in the study. The second survey could be used for comparison with a much larger sample contained in the Education and Training Foundation 2017 Report, to determine whether the characteristics of the teachers in the study were comparable to the broader sector. The results generated from the surveys were limited in terms of how they could be used to inform the study directly, and I abandoned the mixed methods approach in favour of a more qualitative specific approach based on an interpretive paradigm. Nevertheless, the data generated from the first phase survey was useful and acted as a starting point for the development of the interview schedule.

The use of self-administered on-line surveys to gather autobiographical background data of the participants in the study replicated the method employed by Sipila (2010, 2013). The rationale of using online surveys was that they have some advantages, they are convenient to use, allowing rapid distribution of the survey to participating institutes through email and by hyperlink to the Bristol Online survey platform. This way, the survey was accessible to potential participants through the college intranet. Survey results were in a standardized format for use with recognised statistical analysis software packages; this would minimise data handling and inputting errors. The survey data was also updated in real-time and allow liaison with colleges on the numbers of participants taking part in the surveys. However, not everything in life is measurable (Popkewitz, 2004) nor capable of statistical analysis and the second and third parts of the study were conducted using methods more associated with qualitative research.

Qualitative researchers study phenomenon in natural situations attempting to bring meaning to the phenomena through the interpretation of the data given by the participants (Denzin & Lincoln, 2005). This approach attempts to view and interpret the world from the other person's perspective and as I was seeking to understand teachers as individuals, recognizing the differences they have related to other teachers with whom they work, trying to discover individual attitudes and beliefs regarding the integration of technology into the classroom environment and identify any perceived barriers or enablers it was consistent with the study.

As the study focused on the beliefs that teachers hold, providing meaning and understanding of the world from their perspective through their accounts, it could not be value-free, nor was it capable of measurement. It was also not immune from the researcher's background and experiences (Bryman, 2015; Hammersley, 2012; Mackenzie & Knipe, 2006; Mertens 2005; Saunders et al*.,* 2009). The ontological standpoint of the study was that individuals continually construct their meaning of the world which is context dependent. The epistemological perspective was a position of interpretivism recognizing the difference between the objects of natural sciences and people (Bryman, 2015), the main focus of the study was to understand "the subjective world of human experience" (Cohen, Manion, & Morrison, 2007 p. 21).

Constructivist researchers are more likely to approach data collection and analysis from a qualitative perspective. In this study, the view adopted was one where the 1st on-line survey quantitative data was to support and enhanced the collection of qualitative data and deepened the description provided from the participants during the interviews (Mackenzie & Knipe, 2006).

3.4 Design.

The exploratory nature of the research mirrored the nature of research completed by Donnelly et al. (2011). The study encouraged close work with the participants enabling them, through their experiences, to provide an understanding of the complex social events within a real-life context (Baxter & Jack, 2008; Flyvbjerg, 2011; Stake, 2005; Yin, 2013). The interpretivist design utilised a principal method of data collection of interviews supported by self-administered surveys. The use of surveys provided background data for the development of themes and then the interview schedule. There are situations when more than one strategy is used in any particular study, as demonstrated by Prestridge (2012) Sadaf, et al., (2012) and Eteokleous (2008), it was decided therefore to use two self-administered surveys with follow-up one to one semi-structured interviews.

3.5 Methods.

The traditional measures used to evaluate the quality of research have focused on the concepts of validity and reliability and as the accuracy, dependability and credibility of the information depend on it, addressing these criteria are essential in all studies. The emphasis of qualitative research is often in answering questions about experience, meaning and perspective, most often from the standpoint of the participant. In qualitative research, each study is unique, with no expectation of replication. Therefore, the quality of qualitative research is evaluated using terms like quality, rigour or trustworthiness, instead of validity and reliability (Lincoln & Guba, 1985; Seale, 1999; Stenbacka, 2001).

Although the terms ‘reliability’ and ‘validity’ can be contentious, research integrity and robustness are as important in qualitative studies as they are in other forms of research (Lincoln and Guba, 1985). When data are gathered to answer questions of personal or social meaning, with researchers endeavouring to capture real-life experiences, these can never be identical from one study to the next. Nevertheless, faced with increased criticism regarding the reliability and objectivity of qualitative research, qualitative researchers have sought to establish more rigorous criteria and methodological standards (Lub, 2015) and verification strategies for evaluating the credibility of qualitative findings (Morse, Barrett, Mayan, Olson, & Spiers, 2002).

The rational definition of validity does not work well in qualitative naturalistic research. Alternative terms such as authenticity, adequacy, plausibility, neutrality, trustworthiness, credibility, applicability and consistency have replaced validity (Leininger, 1994; Lincoln & Guba, 1985; Maxwell, 1996; Merriam, 1998).

Despite efforts to the contrary by some researchers the range of qualitative methods is too extensive to be represented by a standardised set of criteria and the quality of each project should be determined on an individual basis. Sandelowski and Barroso (2002, p8) maintain ‘‘The only site for evaluating research studies, whether they are qualitative or quantitative, is the report itself’’. Rolfe (2006) goes further stating there is no common understanding of the field of qualitative theory or methodology which can collectively be described as ‘‘qualitative research’’.

Lincoln and Guba (1985) were among the first to develop specific criteria for qualitative research and termed these criteria as trustworthiness and authenticity; they presented these as four sub-criteria:

- Credibility.
- Transferability.
- Dependability.
- Confirmability.

Researchers should attempt to demonstrate that the data presented is a true reflection of the phenomenon being investigated, thereby address concerns regarding credibility. Details of the context of the study will allow the reader to decide whether the context of the study is comparable to another situation and whether the findings can reasonably be applied, thus enabling transferability. The dependability criterion is difficult to achieve in qualitative research; however, researchers should endeavour to enable future investigators to repeat the study, through providing rich detail about the boundaries, context and methods employed.
Researchers ensure confirmability by taking steps to demonstrate that findings emerge from the data and not from their inclinations or biases (Shenton, 2004).

Shenton (2004) went further and identified an extensive list of conditions that could be satisfied by a qualitative researcher wishing to address Lincoln and Guba's four criteria, I have presented these and sought to identify where I believe they have been met, within the current study although not every condition has been met, Appendix B provides a comparison in table format.

3.5.1 Satisfying Shenton's (2004) criteria.

Enhanced credibility of the study was achieved by using well recognised qualitative research data collection methods, surveys and semi-structured interviews. Through on-going communication with the colleges and personal experience in the sector, I had an in-depth knowledge of the prevailing culture that existed in the sector and within the colleges participating. While I was not able to utilise random sampling as a method to identify potential participants, I did not know the participants before their voluntary engagement, eliminating any potential bias that might have occurred.

Partial triangulation of data through using different data collection methods and from different colleges, satisfied one of the dependability criteria in that the study used over-lapping methods which increased confirmability through reducing researcher bias. Shenton (2004), identifies tactics to ensure the honesty of participants as a criteria for credibility, and I believed that the participants were honest with their answers and the candid responses reported in Chapter 5 were evidence of the honesty and integrity of the participants.

Throughout Chapter 3, I have provided an in-depth methodological description of the study, regarded as necessary to meet the dependability and confirmability criteria. I clearly stated using reflective commentary my position, beliefs and any assumptions throughout chapter 3 (Section 3.2.1.4, 3.2.1.6) this also met the credibility and confirmability criteria as defined by Shenton (2004).

Background data established the context of study with a detailed description of the study to promote transferability and allow comparison. At every stage of the study, I set out my background, experience and motivation for undertaking the study. This information was available all potential participants and I used this also as an icebreaker, before the start of each interview. Participant checks of the interview transcripts and interpretation of the responses was available throughout the process and is also a condition of the university ethics approval procedure. The participant's right to withdraw at any stage of data collection was confirmed before each stage. Chapter 5 provides a thick, detailed description of the entire study setting out the results in as much detail as possible to enable other readers to understand the complete study. The process of sample selection, at each stage of the study, has been set out including the use of diagrams, presenting the processes involved throughout the study providing confirmability. The credibility of the current study through identification of previous research that has used similar methods has been clearly stated where applicable in chapter 2, chapter 3 and chapter 5. Identification of the study limitations and potential effects in Chapter 6 supports confirmability.

3.5.2 Identifying Participants and Gaining Access.

The initial phase of the research involved collecting information that would establish the educational and professional autobiographies of the tutors engaged in the colleges taking part in the study. A letter of introduction and request to participate, as well as a sample questionnaire was distributed to the Principal or Chief Executive of 27 institutes across England and permission sought from the principles to engage in the research project (Appendix C). There was a positive response from 9 principals and contacts within the college were identified for further liaison. The principals were very enthusiastic about being part of the project considering the research to be both timely and valuable, as there is now a requirement for vocational and further education colleges to deliver part of their curriculum online. It was seen that the research and results would provide a benchmark for each institute about the capabilities and opinions of staff concerning their perceptions of teaching and delivery using technology.

I met the designated personnel in the nine colleges and discussed the overall rationale and aims of the project. During this meeting, I answered questions raised about the level of involvement and commitment from potential participants. A sample of the first online survey for examination and comments, and minor adjustments were made based on feedback from the designated personnel, but there were more of an editing nature and not critical to the layout or detail of the survey instrument.

3.5.3 Phase 1.

The First stage online questionnaire (Appendix D) was distributed and administered through Bristol Online Surveys, through an agreement with Durham University. This was distributed to the designated liaison personnel in each institute. There was a mixed response from both the teachers and liaison staff concerning participation in the project. The selected method, a self-administered questionnaire, was intended primarily to facilitate the development of the interview schedule by providing background data on teachers experience of and with technology in their teaching practices and identifying themes from the data similar to a method as used by Sipila (2010, 2013).

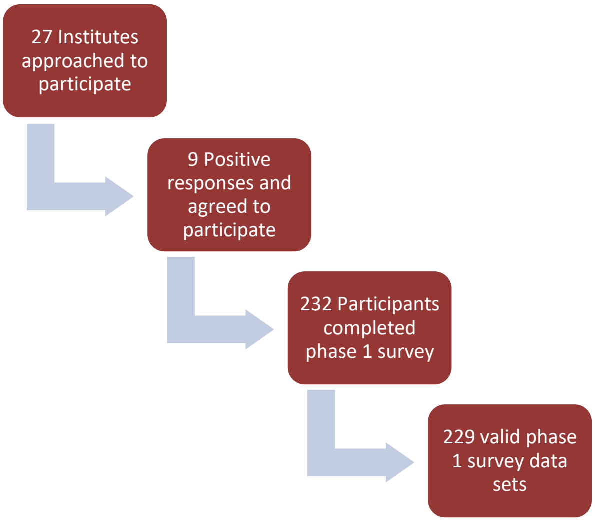

Figure 3.1: Selection and validation of phase 1 data.

3.5.4 Questionnaires.

Questionnaires are a popular way of gathering information in research projects. They are a convenient way of collecting data and are deemed less intrusive and time-consuming than some other methods that could make some participants apprehensive and reluctant to participate (Berdie, Anderson & Niebuhr, 1986; Yang & Hinkle, 2012). The advantages of questionnaires are that they are a cost-effective way of gathering information from a large number of people, are relatively easy to administer, and information collected in a standardized format. The standardized nature of the responses means it is easy to handle, collate and analyse data using a variety of statistical techniques (Munn & Dreyer, 1990). I used web-based questionnaires because I was able to distribute the survey to the participating institutes by sending a hyperlink to the platform hosting the survey. This method of distribution minimized the time required, kept any potential disruption to a minimum, and it was easy to distribute to all staff through the college internal email system.

The study's standardized data sets were exported from the Bristol Online Survey website and were updated in real time. For analysis, data was exported directly into the IBM Statistical Package for the Social Sciences (SPSS) programme. A series of one-way analysis of variance (ANOVA) tests were conducted to determine whether there were any statistically significant results across a range of dependent and independent variables. Dependent variables of age, subject area taught and years of teaching experience and independent variables of the type and level professional development of teachers in the use of technology, frequency and type of interaction with technology in teaching practice and teacher self-efficacy and competence in performing specific tasks using technology in their professional life were analysed. Participants were assigned to one dependent variable group only this is sometimes referred to as an attribute independent variable because individuals are allocated to a group based on some attribute that they possess. ANOVA tests were used to analyse the data from the first questionnaire as they control Type I errors. Type 1 errors are false positives and occur when statistically significant differences occur when there are none. ANOVA therefore give greater confidence in any statistically significant results produced.

3.5.5 Summary of Phase 1 Survey.

The study was conducted across nine Post-Compulsory Further Education Colleges in England. A series of one-way analysis of variance (ANOVA) were conducted to identify any statistically significant results and identify and any recurring themes. The data was then used to facilitate the development of the interview schedule by providing background data on teacher's experience of and with technology in their teaching practices. The data generated from several key variables concerning the integration of technology in teacher's professional lives is presented in Chapter 4, and full data analysis is in Appendix E.

The data sets were manipulated and collapsed for ease of handling and analysis, an example of this was that 57 different locations were entered by participants to identify their location it was possible to collapse this data and identify the nine parent colleges participating. A similar process of collapsing was undertaken where different terminology was used by the participants to indicate the subjects that were taught. There were initially 41 different subjects identified that were collapsed into seven subject families or groups. Chapter 4 provides details, and Appendix E gives a full set of statistical results.

3.5.6 Phase 2.

After the analysis of the 1st phase survey, another survey was compiled to obtain additional data that would give me a sense of the people taking part in the study and working in the colleges taking part. It would also be possible to compare the teacher profiles with a larger survey, from the Education and Training Foundation 2017 Report, to determine whether the sample was comparable with the wider Vocational sector and exhibited similar characteristics. However, there could be no claim that such a small sample was representative of the sector at large. A second survey (Appendix F) was distributed directly to these participants, another on-line self-administered survey, but the questions allowed for a more narrative response to obtain data that provided more details of background and qualifications and produced similar results to the data reported in the Education and Training Foundation 2017 Report (Appendix G). Participant profiles were established from the data provided, and the flow chart below shows the process of selection and validation of phase 2 data. The primary purpose of this questionnaire was to build a profile of the teachers participating and provide a sense of the teachers working in the colleges.

Figure 3.2: Selection and validation of phase 2 data.

3.5.7 Interviews.

If you want to know what people think it is best to ask them, conversation is a basic human characteristic, and during these conversations, people talk and interact with each other while posing and answering questions. Through these conversations, we get to know about experiences, feelings, perceptions and discover the world in which others live. The interview is an inter-view where knowledge is constructed through inter-action between the interviewer and the interviewee and provides a useful way for researchers to learn about the world of others. Although it is not possible to ever be as one with the other person, it is possible to discover about the lives of the other through their own words and the use of interviews (Kvale, 2007; Qu & Dumay, 2011).

Interviews can be used in many ways depending on the type of data that is being sought. The more structured the interview technique, the more standardized the data generated, the less structured the interview, the more detailed and in-depth the data (Bryman, 2015). The purpose of the study is to understand the perceptions and beliefs of teachers regarding the integration of technology into their teaching practices, these perceptions vary depending on the context and would be personal and individual to each participant. There were several types of interview that I could have used for data collection purposes, and each interview type has its advantages and drawbacks when used in research studies. The method of data collection that I selected was semi-structured interviews incorporating visual methods.

Semi-structured interviews are often the most effective and convenient means of gathering information (Kvale and Brinkmann, 2009), because it is based in conversation, allowing modification of style, pace and order of questions to uncover the deepest responses. It enables interviewees to provide responses in their terms and in the ways that they think and use language, thus providing accounts of how the participants perceive their world. A primary technique used in semi-structured interviews is the use of scheduled and unscheduled probes, providing the researcher with the means to draw out more complete narratives from the interviewees, drilling down into a particular topic (Bryman, 2015; Coolican, 2013; Mears, 2012; Qu & Dumay, 2011). This contrasts with structured interviews where participants are asked the same questions in the same order allowing only a limited number of response categories, this technique would not produce the rich detail that I was seeking in the current study, but structured interviews are considered to be easier for data comparison and analysis because of the limited responses (Bryman, 2015; Coolican, 2013; Mears, 2012; Qu & Dumay 2011).

Semi-structured interviews are flexible and are capable of unearthing important and hidden facets of human behaviour, and this is the data that I wanted to unearth. I set out prepared questions, guided by the themes that emerged from the 1st phase survey, in a consistent manner, interposed with probes designed to elicit more detailed responses. The focus of semi-structured interviews was a series of broad themes to be covered during the interview to help direct the conversation toward the topics and issues about which I wanted to learn. The purpose of the schedule is to ensure the same thematic approach is applied during each subsequent interview (Bryman, 2015; Coolican, 2013; Mears, 2012; Qu & Dumay, 2011). I incorporated photo-elicitation to present a consistent series of themes that were to be discussed based around themes and barriers that had been identified in previous research (Ertmer, Ottenbreit-Leftwich, Sadik, Sendurur, & Sendurur, 2012; Prestridge, 2012; Sipila, 2013, Zhao et al. (2002) and themes that had emerged from the survey data. These visual images acted as cues, provoking more in-depth discussion, eliciting more detailed and rich information from the participant (Fiedler & Posch, 2009; Pink, 2004). The intention was that the images would provide a way for each participant to convey their vision of the world in the context of their teaching and experience (Clarke-Ibanez, 2007; Collier, 1967).

The rationale for using image-elicitation within semi-structured interviews was to empower participants in a way unachievable through more traditional methods of data collection, such as structured interviews, which may have been perceived as hierarchical and distant from the participants. This approach moved from doing research on participants, to doing research with participants, recognizing that participants are the experts in their own lives (Bryman, 2015; Denzin & Lincoln, 2013; Karlsson 2012). Photo (image) elicitation has the potential to illuminate the lives of participants from their perspective, identifying what is important to them through the discussion of visual images (Fiedler & Posch, 2009; Pink, 2004) while enabling me to discover the perceptions they had regarding the integration and use of technology in their teaching practices.

The semi-structured format enabled me to keep the interview on track as, the alternative of unstructured interviews, can sometimes lead to rambling and veering off on tangents. While unstructured interviews may produce rich data, they can also adversely affect the interview if there are time constraints, as well as generating large quantities of data that could make transcription and coding more problematic (Bryman, 2015; Coolican, 2013; Mears, 2012). The use of unstructured interviews may also support the view expressed by some quantitative researchers that the data produced through qualitative interviews is “unreliable, impressionistic, and not objective” (Denzin and Lincoln, 2005, p. 12). To these researchers, interviews are regarded as nothing more than informal routine conversations.

3.5.8 Preparation of interview schedule.

The first stage of preparing for the one-to-one interviews was to identify broad themes that had been acknowledged from previous research regarding the integration of technology in teaching practices. Having identified the themes, I then developed eight questions that would form the central topics of the interview. Having satisfied myself with the questions to be set, I then searched for images that would reflect three different positions or responses to each question. The visual images were only to provide cues and prompt more detailed discussion. These images were moderated independently to try to ensure that they were seen as reflecting similar viewpoints between the originator and the mediator. The images were modified until there was agreement on each image. When it was deemed that there were perceived in similar ways for each of the questions, the interview stage could be progressed (Appendix H).

As I intended that the interviews would be primarily led by the participant, my role was mostly to keep the discussion loosely on track and ask occasional open-ended questions. The duration of the interviews was difficult to determine with any precision. I envisaged that they would be between forty and sixty minutes. Digital recording of interviews allowed me to concentrate on the responses of each participant rather than taking notes; it also enabled more straightforward transcription and analysis of data.

A pilot interview with a college coordinator was arranged, the coordinator was not part of the study, but had an insight into the overall project something that had been suggested as beneficial by Bryman (2015). The pilot interview provided me with experience of using the interview schedule; it gave more clarity and identified adjustments that were necessary to the questions, format or sequencing for the actual interviews. After the pilot interview, I was able to determine the adequacy of the instrument without impact on the sample while I gained useful feedback as to the performance of the instrument as well as the interviewer (Bryman, 2015).

3.5.9 Phase 3 Data Analysis.

The use of interviews to collect data and subsequent transcription can quickly lead to data analysis become overwhelming, due to the quantity of data produced in a relatively short time (Bryman, 2015). The interviews, when completed were transcribed verbatim, after this process the interviews were then transcribed a further twice to remove fillers and pauses and make reading and coding easier, an example is included in Appendix I. I selected thematic analysis as the method of analysis because it is accessible and flexible and as Braun, Clarke, Hayfield, & Terry (2019) state offers an entry into an area that may be regarded as complex for researchers that are new to qualitative research.

Thematic analysis is aligned with a constructionist stance recognizing the context of the situation, identifying themes and patterns across data sets which allows researchers to see shared meanings or experiences, identifying what is common and relevant to answering the research questions (Braun & Clarke, 2006).

Through analysis of the two self-administered surveys, the familiarisation process with the data started. The statistically significant results that were reported began the process of generating initial codes that were supported by previous research (Ertmer, 2005; Zhao et al. 2002). The familiarisation process continued through the verbatim transcription of the interviews, reproducing all spoken words and sounds. Subsequent re-transcription of the interviews continued for ease of reading and increased familiarisation with the data. Through this process, themes and sub-themes began to emerge from the detailed reading and re-reading of the transcripts and listening to recordings of interviews.

The process for generating themes was straight forward and reflected something significant within the data related to the research question. I used what has been termed bottom-up inductive coding, that is derived directly from the data, as I had no prior knowledge of the participants' responses. The alternative, deductive coding, adopts a top-down approach where ideas and topics are developed before analysis begins. Braun et al. (2019) argue that rather than this being a binary, either/or decision in how the analysis of data is conducted. It is more often a combination of approaches, although one will take precedence. A combination of approaches was used, in reviewing the literature around the study, previous research had identified many of the barriers that existed regarding integration of technology into teacher's practices, and models presented by Ertmer (2005) and Zhao et al. (2002) were used to support the analysis. Nevertheless, the data was analysed in a way that fairly represents what I saw and heard, but it cannot be value-free (Lichtman, 2010). The use of inductive or deductive coding has a bearing on how the data is interpreted and presented. Inductive coding focuses on the meaning from the participant and researcher while deductive coding focuses on the data and theory-based meaning Braun et al. (2019). The generation of themes was determined by using my judgement as I deemed them to emerge from the data with no fixed process (Bryman, 2015; Braun & Clarke, 2006; Coolican, 2013). Inevitably, the themes are based on my own set of assumptions and the reality I decided the data represents, in this situation, transparency is vital (Braun & Clarke, 2006).

3.6 Sample.

In purposive sampling, the participants are deemed to have relevance to the research questions being posed. Purposive sampling is useful where there is a need to reach a targeted sample quickly, enabling selection of cases that allowed me to answer the research questions and was a sampling technique used in similar studies conducted by Ertmer et al. (2012) and Chen (2008). I selected a subcategory of purposive sampling identified as expert purposive sampling that involved assembling a sample of participants with known or demonstrable experience and expertise in the study area. (Bryman 2015; Saunders et al., 2009; Trochim, 2006). The sample assembled for the study consisted entirely of teaching practitioners from colleges delivering courses in Further and Vocational Education in England.

Research Phase	Number of Participants
Phase 1	**229**
Phase 2	**22**
Phase 3	**11**

Table 3.1: Number of participants in each phase of the study.

3.6.1 Breakdown of Sample in phase one survey.

Two hundred thirty-two participants submitted survey results; 229 of these submissions were accepted as valid based on the purposive sampling technique used in the study, three (3) were discarded. At this time, 92 participants indicated that they would be prepared to participate in later stages of the project.

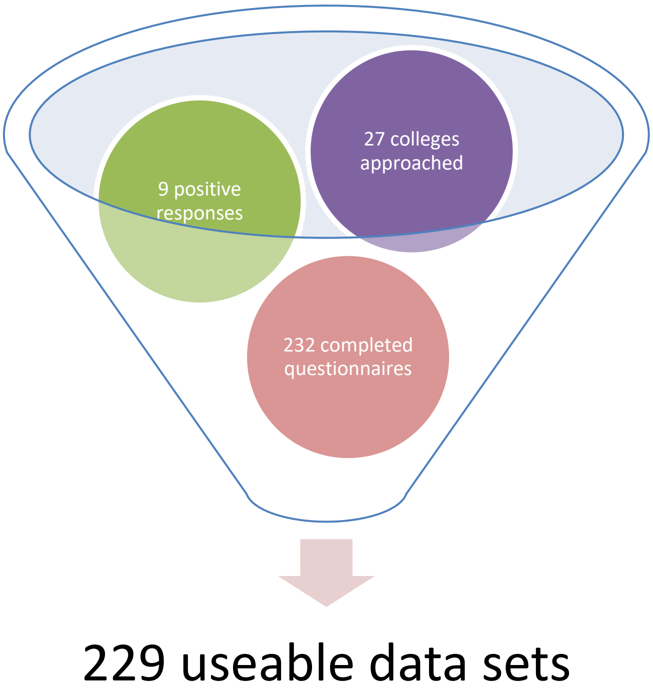

Figure 3.3: Selection of phase 1 sample

3.6.2 Breakdown of participants in phase 1 survey by independent variable.

Independent Variable	Category	Number of participants
Age	=<29Years	28
	30 - 39 years	60
	40 - 49 years	70
	=>50 Years	71
Years of teaching in F.E.	One year or less	10
	1 – 3 years	33
	4 – 10 years	88
	11 – 20 years	71
	21 years or more	27
Subject area	Academic	69
	Engineering	30
	Vocational specific	73
	Vocational related	12
	Computing & design	18
	Higher education	7

Table 3.2: Breakdown of participants in phase 1 by the independent variable.

3.6.3 Breakdown of participants in phase 2 survey by independent variable.

Independent Variable	Category	Number of participants
Age	=<29Years	1
	30 - 39 years	3
	40 - 49 years	9
	=>50 Years	9
Years of teaching in F.E.	4 – 10 years	11
	11 – 20 years	6
	21 years or more	5
Subject area	Academic	4
	Vocational specific	7
	Vocational related	2
	Computing & design	8
	Higher education	1

Table 3.3: Breakdown of participants in phase 2 by the independent variable.

3.6.4 Breakdown of participants in phase 3 survey by independent variables.

Independent Variable	Category	Number of participants
Age	=<29Years	0
	30 - 39 years	2
	40 - 49 years	2
	=>50 Years	7
Years of teaching in F.E.	4 – 10 years	4
	11 – 20 years	2
	21 years or more	5
Subject area	Academic	5
	Vocational specific	3
	Vocational related	2
	Computing & design	1

Table 3.4: Breakdown of participants in phase 3 by independent variable.

3.7 Ethical Considerations.

There are numerous guidelines and fundamental principles that need to be observed when conducting research which involves people (British Education Research Association (BERA), 2011; Lichtman, 2010). One overarching principle is to do no harm to the participants in the study; this is central to all of the codes of practice published by professional and academic research organizations (Bryman, 2015; Coolican, 2013; Gorard, 2013; Hammersley & Traianou, 2012; Lichtman, 2010). After taking these principles and guidelines into consideration and developing a research strategy, the project was given ethical approval from Durham University School of Education Ethics Committee on the 28th April 2017 (Appendix A).

3.7.1 Voluntary and informed consent.

The participants engaged in the study based on the principle of voluntary informed consent (Bryman, 2015; Coolihan, 2013; Hammersley & Traianou, 2012). Information sheets giving details of the purpose, processes involved, the nature and rationale for the research, including who would have access to the results, were distributed to potential participants before any commitment to take part was given. The details were initially distributed through the institute coordinator to potential participants, this informed potential participants that they also had the right to withdraw at any stage before, during or after completion of any stage of the study (Bryman, 2015; Coolihan, 2013; Sammons, 2005).

A statement of acknowledgement of participation on a voluntary and informed basis and giving permission for the data to be used for the research study was included before the final submission of data at the end of the survey questionnaire. This satisfied another principle of ethical research participation that agreement was given without duress or coercion at each stage of the data collection process. (Bryman, 2015; Coolican, 2013; Sammons, 2005). Participation was voluntary with no incentives offered or expected, and therefore, I accepted it was inappropriate to set deadlines that would impinge on the participant's life (Lichtman, 2010).

3.7.2 Anonymity and Confidentiality.

One of the main pillars of ethical research is the preservation of the anonymity and confidentiality of participants. It is imperative to protect data collected from participants and avoid discloser of data without their express written permission (British Sociological Association, 2017). It was vital to maintain participant anonymity and confidentiality, not only from an ethical perspective relevant to this study, but to also maintain credibility and goodwill from the participants for any potential future research projects that may request their participation (Coolican, 2013).

All references to the institutes and participants were erased from all transcription and substituted with pseudonyms which is considered as a common technique to maintain anonymity (Bryman, 2015; Coolican, 2013; Scottish Education Research Association, 2005). Digital recordings were stored in a secure file location with password protection, and not stored on any computer with unrestricted or shared access, in line with the requirements of the Data Protection Act 1998. The use, access and storage of the data was in accordance with the Data Protection Act 1998 and relevant areas of the Research Governance Framework, as cited in Bryman (2015 p137).

Whilst anonymity is relatively easy to achieve Coolihan (2013) opines confidentiality, when applied in a literal sense, would not be of much value in a research environment where data may be accessed by other researches. In a research context confidentiality means not disclosing participant information accidentally or deliberately, not discussing information with others and ensuring that information is presented in a way that prevents identification of participant (Wiles, Crow, Heath & Charles, 2008).

Open and honest disclosure of the results of the surveys and interviews is another of the main ethical principles, (BERA 2011; Lichtman, 2010; SERA, 2005) the data was analysed in a manner that avoided misrepresentation or fraudulent analysis. The data fairly represents what

I have seen and heard, but will inevitably reflect my stance, set of beliefs and assumptions; it cannot be value-free (Lichtman, 2010).

Chapter 4 – Results.

4.1 Introduction.

The results presented in this chapter relate to the data collected from the Phase One self-administered online questionnaire. This questionnaire examined perceived self-efficacy regarding the use of technology in preparation for lessons and classroom practices. The second section examined potential barriers to the integration of technology identified by teachers in the study and evident in previous research. The final section focused on Continued Professional Development (CPD) offered or undertaken by teachers in the study that had relevance to teacher self-efficacy in technology use.

The data was analysed using One-Way between-subjects ANOVA to identify any statistical significance using a range of dependent and independent variables. The dependent variables were associated with five main topics, teacher's confidence in performing specified tasks using technology, the frequency and type of engagement that teachers had with technology in their teaching practices, perceived barriers that existed to the integration and use of technology in the classroom and CPD or training that had been offered or undertaken. The one-way between-subjects ANOVA used Age, Subject Area, and Teaching Experience as three independent variables, the results are presented in the following three sections under general themes that have been identified using only statistically significant results at the <0.05 level. The results presented here provide an overview of results for ease of readability; there are a full set of all results contained in Appendix E.

The presentation format for each series of analysis will be an introduction followed by a summary table of findings and a short interpretation of the findings.

4.2. Teachers perceived self-efficacy in using technology for teaching preparation and delivery.

4.2.1 Introduction.

Self-efficacy (section 2.4.8) has been defined as the belief an individual has about their capabilities to perform a specific action or as having the skills necessary to perform a specific behaviour (Bandura 1995; DiClemente et al., 2009). An individuals' efficacy expectations are significant as it determines the initial decision to perform a behaviour, the effort expended and the individual's persistence in the face of adversity (Bandura, 2006). Research concluded that efficacy in technology in general, using word processing, email and browsing the web, has not translated into the integration and use of technology in the teaching and learning environment (Lau & Yuen, 2013; Messina & Tabone, 2013; Shawer, 2013). Self-efficacy is considered a second-order barrier as identified by Ertmer (1999) and as a barrier within the teacher domain by Zhao et al. (2002).

In section 2.5, several factors were identified as determining whether an individual will adopt technology (MacCallum et al., 2014; Rogers, 2003; Saadé & Kira, 2007; Straub, 2009). Teachers must see a tangible benefit for them (the teacher) from integrating technology into their classroom practices to begin to modify their beliefs and attitudes toward technology integration and use (Brown et al., 2012).

The results presented below include a summary table of results (Table 4.1), and a brief interpretation of the statistically significant results concerning the teachers perceived self-efficacy in using technology for tasks associated with teaching preparation and delivery, a full set of results are in Appendix E.

4.2.2 Summary of statistically significant results on “Teacher perceived self-efficacy in the use of technology for tasks linked to teaching and delivery.”

Summary of results of the One-way between-subjects ANOVA in “Teacher perceived self-efficacy in the use of technology for tasks linked to teaching and delivery.”			
Condition	Age	Subject Area	Teaching Experience
Create an online questionnaire.	<40 more confident		
Create a presentation with simple animation.	<40 more confident		
Creating a presentation with video.	<40 more confident]		
Download resources from a learning platform.	<40 more confident		
Preparing material for use with whiteboards.	>40 more confident		=>11 years higher confidence
Using technology to collect resources for use in class.	<30 more confident]		
Teachers using applications to prepare exercises for students.	<40 more confident]		
Using resources from existing educational sources.	<40 more confident]	Academic and Vocational Related have highest confidence	

Table 4.1: Summary of statistically significant ANOVA results showing teacher perceived self-efficacy in using technology in tasks linked to teaching and delivery.

4.2.3 Interpretation of results from Analysis of Variance into teachers perceived self-efficacy in using technology for teaching preparation and delivery.

We can see from the data (Table 4.1) that age played a significant part in how confident the teachers in the study felt about the overall use of technology in their classroom practices. Several separate analysis' of variance were carried out yielding ten statistically significant results at the <0.05 level. There is a general pattern; eight out of the ten results suggested that age is directly related to the level of confidence of individual teachers in tasks linked to the use of technology for teaching and delivery. Further, it is noteworthy that seven out of the eight results indicated that younger teachers, under the age of 40, were more confident in using technology for tasks related to teaching preparation and delivery.

A second significant set of findings indicates that when it came to using technology to collect resources to be used in classroom delivery all teachers under 30 years of age indicated that they collected resources in this way often or all of the time. Teachers aged 30 years and older used technology less frequently, and some teachers never or rarely collected resources for use in this way.

Similar findings can be observed for when it came to using technology in the preparation of tasks for students, teachers under 40 years of age were more likely to use technology in the preparation of tasks for students than teachers aged over 40 years of age.

When it comes to sources of material used for the preparation of resources it can be seen from table 4.1 that teachers under 40 years of age and teaching in Academic and Vocational specific subject areas were more likely to use resources from existing educational sources than were teachers aged 40 years of age and older and other subject areas. It was not possible to determine if there was any relationship between the age of the teacher and subject areas through the analysis conducted at this time.

Similarly, age effects contributed to the ability to carry out a range of tasks using technology. Teachers under the age of 40 years were more confident in being able to create an online questionnaire than participants aged 40 years and over, similarly, they felt a higher degree of confidence when incorporating animation or video into presentations. Furthermore, the under 40 years age groups felt more confident downloading resources from websites and learning platforms than teachers aged 40 years and over.

The analysis of variance carried out for the confidence of teachers in preparing materials for use with interactive whiteboards produced two statistically significant results at the 0.05 level, one based on age and the other on teaching experience. Teachers aged 40 years and older were more confident in creating materials for use with Interactive White Board technology than teachers in the 40 years and younger age group.

Teachers with more than 11 years of teaching experience also expressed more confidence in this task than teachers with less than 11 years of teaching experience. Teachers with more than 11 years teaching experience would have been working the sector when IWB's were being introduced and may have undergone specific training in their integration and use, but it is not possible to determine this based on the analysis completed at this time, similarly teachers aged 40 years and over may have undertaken similar training, but again it is not possible to confirm this at this time.

4.3 Barriers and facilitators to support the use of technology in Further/ Vocational Education?

4.3.1 Introduction.

The integration of technology takes a considerable commitment and fundamental changes to teaching practices that cannot happen in the short term (Chandra & Mills, 2015). Even when teachers are enthusiastic about integrating technology into their teaching practices, many abandoned the technology due to frustrations and barriers, perceived or real that cannot be overcome or dismissed. The type and complexity of barriers were identified in section 2.3 and 2.4 earlier. The phase one questionnaire considered many of the factors previously identified as potential barriers from previous research. These areas included many first-order barriers (Ertmer, 1999) and the technological infrastructure aspect of the context domain identified by Zhao et al. (2002). These reflect resources, training and CPD in the use of technology and teacher efficacy in the use and application of technology in their teaching practices.

The results presented below include a summary table of results (Table 4.2) showing the result and mapping the result against the models identifying first and second-order barriers (Ertmer, 1999; Prestridge, 2012) and Zhao et al. (2002) conditions for classroom technology integration. There is then a brief interpretation of the statistically significant results concerning the perceived barriers to the integration of technology into classroom practices, a full set of results are in Appendix E.

4.3.2 A Summary of statistically significant results regarding barriers perceived as impacting on the integration and use of technology.

Summary table of statistical significance results regarding barriers perceived as impacting on the integration and use of technology			
Condition	Age	Subject Area	Teaching Experience
Insufficient number of computers.	Barrier for <30 Ertmer 1st Order Zhao et al. Context Tech Infrastructure		
Insufficient bandwidth.		Barrier Academic, Voc. Specific subjects Ertmer 1st Order Zhao et al. Context Tech Infrastructure	
Insufficient portable devices.	Barrier for <40 Ertmer 1st Order Zhao et al. Context Tech Infrastructure	Barrier for Academic, HE, Voc. Specific subjects Ertmer 1st Order Zhao et al. Context Tech Infrastructure	
Lack of pedagogical models.	Barrier 40 years Ertmer 2nd Order Zhao et al. Teacher Pedagogical Compatibility		
Pressure to prepare students for examinations.		Barrier for Academic, Voc. Specific subjects Ertmer 1st Order Zhao et al. Context Org. Culture	

Table 4.2: Summary of barriers perceived as impacting on the integration and use of technology.

4.4.3 An Interpretation of Statistically Significant Results of perceived teacher barriers to the integration of technology into classroom practices.

We can tell from the data (Table 4.2) that age and subject area played a significant part in the identification of barriers that were perceived to exist by teachers in their classroom practices. Several separate analysis of variance were carried out yielding six statistically significant results at the <0.05 level; three out of the six results related to age and the remaining three results related to subject area. There was one condition where age and subject area both revealed statistically significant results. e subject area being taught.

Insufficient number of computers acted as a barrier to the integration of technology into teaching practices for teachers up to the age of 30 years of age than for teachers in any other age group. When mapped across to the two models identified earlier lack of hardware was identified as a first-order barrier by Ertmer (2005) and Prestridge (2012) and was aligned with the context domain presented by Zhao et al. (2002) occupying a position within technology infrastructure.

Analysis of the data regarding the access and availability of portable devices teachers under the age of 40 years perceived this first-order barrier to be a significant inhibitor of technology use and integration than teachers aged 40 years of age or older, this barrier is identified by Zhao et al. (2002) as within the context domain of technology infrastructure.

The lack of portable devices was considered a barrier to technology integration in teaching practices by teachers in academic, higher education and vocational specific subject areas more than in other subject areas.

The analysis of variance for insufficient bandwidth being a barrier to technology integration showed that teachers in Academic and Vocational Specific subject areas perceived this to be a barrier more than other subject areas. Insufficient bandwidth is a first-order barrier (Ertmer, 2005) and within the context domain as technology infrastructure (Zhao et al., 2002).

Teachers within the Academic and Vocational Specific subject areas perceived that pressure to prepare students for examinations was a barrier to technology integration in classroom practices. Ertmer (2005) and Prestridge (2012) considered this to be a 1st Order barrier related to lack of time while Zhao et al. (2002) believed this barrier was related to the organisational culture within the context domain.

4.4 Technology related Continued Professional Development (CPD) - Teacher Participation.

4.4.1 Introduction.

It is often incorrectly assumed that competency in using digital technology in everyday applications is somehow ample to be able to use technology effectively in teaching (Prestridge, 2012). Such assumptions may contribute to a perception among teachers that there is a general lack of support and training for the effective integration of technology into teaching and delivery. It has been suggested that eighty hours of specific continued professional development (CPD) is required before teachers can begin to integrate technology effectively into their teaching (Carlson & Gadio, 2002) while Marcinkiewicz, (1993), suggests that it will take up to six years before teachers can fully acquire the expertise to use technology effectively.

Research conducted previously concluded that some of the anxiety exhibited by teachers, when faced with technology integration into their teaching practices, is down to the lack of training and resultant lack of efficacy (Celik & Yesilyurt, 2013). Regardless of the benefits, real or perceived, of technology-supported education, the level of training given to teachers on how to use technology in education and the classroom practice remains limited (Al-Senaidi et al., 2009; Lee, & Tsai, 2010). Lack of training has been identified (Ertmer, 2005; Prestridge, 2012; Zhao et al., 2002) as a barrier contributing to the lack of integration of technology by teachers.

The results presented below include a summary table 4.3 and a brief interpretation of the statistically significant results at the <0.05 level, concerning teacher participation in training and CPD related to technology use and integration. A full set of results are in Appendix E.

4.4.2 A Summary of statistically significant results regarding participation in training and CPD courses.

Summary table of statistically significant results of teacher participation in training and CPD courses.			
Condition	Age	Subject Area	Teaching Experience
Introductory courses on internet use and general applications	Under 30 less likely		<11 years of experience less likely to participate
Equipment specific training			<4 years of experience less likely to participate
Subject-specific courses	Under 40 less likely		<11 years of experience less likely to participate
In-house training	Under 40 less likely		<11 years of experience less likely to participate
CPD training provided from external sources	Under 40 less likely		<4 years of experience less likely to participate

Table 4.3: Summary of ANOVA results showing statistically significant results for participation in training courses.

4.4.3 Interpretation of statistically significant results regarding participation in Training and CPD.

From the results presented in the data (Table 4.3), age and teaching experience acted as a significant factor in whether teachers took part in different CPD courses related to the integration of technology into their teaching practices. Several separate analysis of variance were carried out yielding nine statistically significant results at the <0.05 level. The results showed a pattern where age is directly related to the participation in CPD courses in 4 of the results. Teachers aged under 40 years are less likely to participate in the CPD courses related to the integration of technology than teachers aged 40 years and over. Furthermore, there was a similar pattern of 5 statistically significant results related to teacher experience that showed that teachers with more teaching experience were more likely to participate in the technology integration CPD courses than teachers with the least teaching experience.

4.4.3.1 Introductory courses on internet use and general applications.

When it came to taking part in introductory-level courses in computers, internet use and general applications teachers in the age group under 30 years of age were the least likely to undertake this type of CPD course. As the age of the teachers increased, so did the levels of participation. When teacher experience was analysed teachers with 11 years of teaching experience or more were more likely to undertake these courses, teachers with less than 11 years of teaching experience had lower levels of participation.

4.4.3.2 Equipment specific training.

The results showed that teachers with less than four years of teaching experience were the least likely to take part in equipment-specific training. The more teaching experience teachers had, the more likely they were to undertake this type of CPD.

4.4.3.3. Subject-specific courses.

The data results presented in Table 4.3 suggests that teachers aged under 40 years of age were less likely to participate in subject-specific training using technology than teachers aged 40 years or older. The analysis of data regarding teacher experience showed that teachers with less than 11 years of teaching experience were less likely to participate in subject-specific training courses involving technology than teachers with 11 years or more experience.

4.4.3.4. In-house training.

Teachers aged under 40 years of age were less likely to participate in in-house training courses than teachers aged 40 years and over. Teachers with less than 11 years of teaching experience were less likely to participate in in-house training courses than participants with 11 years or more teaching experience.

4.4.3.5 CPD training provided from external sources.

The results show that respondents aged 40 years and older were more likely to participate in externally provided training. The results indicate that participants with less than four years of experience are more unlikely to participate in CPD courses provided by external bodies. Participants with more than four years of teaching experience are more likely to participate in externally provided CPD courses.

4.5 Summary.

The results presented in this chapter relate to the data collected from the Phase One self-administered online questionnaire and was used to develop the interview schedule by providing background data on teacher's experience of using technology in their teaching practice. Analysis of the data showed the effect of age to be the most statistically significant factor, younger teachers under the age of 40 years of age considered themselves more confident in using technology than teachers aged 40 and older. Teachers aged under 40 years of age were the least likely to participate in technology-related continual professional development courses and identified more barriers to the integration of technology into their teaching practice than older teachers. Furthermore, analysis of teaching experience showed that teachers with more teaching experience were more likely to participate in the technology integration CPD courses than teachers with less teaching experience. There were two subject areas Academic and Vocation Specific subjects that identified barriers related to the integration of technology.

From the analysis of the data from the online questionnaire, it was possible to build a more detailed picture of the participants in the study and develop an interview schedule for use during the semi-structured one-to-one interviews. The results of the interviews are presented in the following chapter and were a result of using thematic analysis and bottom-up inductive coding that is derived directly from the data. The themes that emerged related directly to the central area of the study that investigated the thoughts and beliefs of teachers in the post-compulsory colleges regarding the integration and use of technology in their teaching practice.

Chapter 5 - Thematic Analysis.

5.1 Introduction.

The main aim of the study was to investigate the beliefs and attitudes of teachers working in Further and Vocational Education colleges concerning the use and integration of technology into their teaching practices. The initial data collection process was through the distribution and completion of an online self-administered questionnaire (Appendix D) and detailed in section 3.4.3.

Several one-way between-subjects ANOVA related to the continued professional development (CPD) provided and undertaken by teachers in the use of technology were carried out the results are in section 4.4. The data was analysed regarding perceptions of potential barriers to the integration of technology into teacher practice and the results presented see section 4.3. Section 4.2 shows the results of the one way between-subjects ANOVA regarding teachers perceived self-efficacy in performing specific tasks using technology in the professional practices.

The selected method, a self-administered questionnaire, was intended mainly to facilitate the development of the interview schedule by providing background data on teachers experience of and with technology in their teaching practice and identifying themes from the data similar to a methods as used by Sipila (2010, 2013).

After the analysis of the 1st phase survey, a second survey was compiled to obtain additional data that would give a sense of the people taking part in the study and working in the colleges taking part. It would also be possible to compare the teacher profiles with a more extensive survey, from the Education and Training Foundation 2017 Report, to determine whether the sample was comparable with the wider Vocational sector and exhibited similar characteristics. However, there could be no claim that such a small sample was representative of the sector at large. There were 21 completed surveys, on completion of the 2nd self-administered survey, the participants were approached to determine if they were willing to participate in one to one semi-structured interviews. Eleven teachers participated in the one-to-one interviews the data from which form the basis of this chapter.

Through a process of iterative analysis of the interview transcripts, recurring themes emerged from the interviews data. These themes were extrinsic barriers; within this theme were six identified sub-themes presented in section 5.2.1. The next theme that arose was intrinsic barriers with the interview data reflecting efficacy and core beliefs of teachers. This theme contained nine sub-themes presented in section 5.2.2. The role and perception of technology was the next theme to appear see section 5.3, showing how teachers use technology in their teaching practice and the perceived usefulness that technology had in their teaching. The final theme that came out of the interviews concerned the management of the integration of technology in the colleges and how the integration is affected by external forces, internal decisions related to technology integration, management style and college culture (section 5.4). The diagram below, Fig 5.1, shows the barriers and themes that emerged from the interview data.

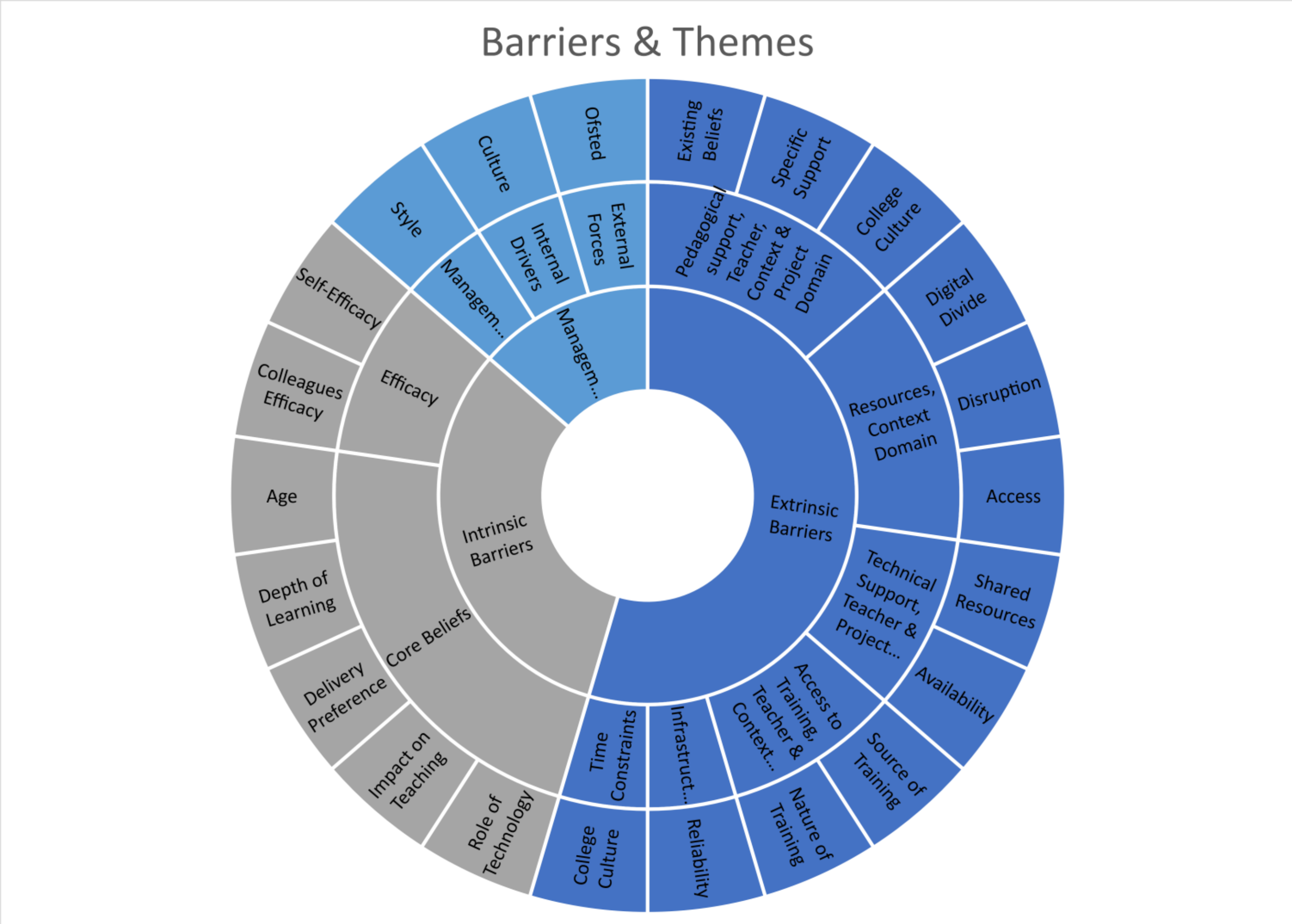

Figure 5. 1: Barriers and Themes from Interview Data

5.2 Identified barriers to the integration of technology.

The first theme identified from the one to one interviews related to the perceived barriers that exist to the integration and use of technology by teachers. First-order barriers are extrinsic and can be quantified in some way, lack of resources, lack of training, poor technical support, I.T. infrastructure, connectivity and bandwidth availability and lack of time. Second-order barriers are more intrinsic and can change depending on the context, they are difficult to measure and are concerned more with feelings, beliefs and attitudes of teachers (Ertmer, 2005; Prestridge, 2012). The binary nature of the barriers, presented by Ertmer (1999) in section 2.3.3.1, were further developed by Zhao et al. (2002) in section 2.3.3.2 and expanded and presented as three domains that contained 11 factors that were deemed to act as barriers to technology integration in the classroom.

5.2.1 Extrinsic Barriers to technology integration.

Many barriers to technology integration are extrinsic and centred principally around quantifiable facets. Although there has been continued investment from governments, extrinsic barriers continue to exist and remain a continued source of frustration to teachers (Akcaoglu et al., 2015; Cárdenas-Claros & Oyanedel, 2015; Goktas et al., 2013). The integration of technology takes time to become effective; it requires changes to move from teacher-centred to learner-centred approaches and cannot be achieved in the short term (Chandra & Mills, 2015). Even when teachers are enthusiastic about using technology, there remain many barriers to successful integration into teaching practices.

In this section, I present the data that relates to the extrinsic barriers that were reported by the teachers taking part in the study and compare these too previous research presented by Ertmer (1999) and Zhao et al. (2002) and other research discussed previously in the literature review, see section 2.4. 6 topics emerged from the data and were categorised as extrinsic barriers to technology integration.

5.2.1.1 Lack of resources.

Successive U.K. governments have continued to invest in technology in education, and many of the identified extrinsic quantifiable first-order barriers (Ertmer, 1999) see section 2.3.3.1 or deficiencies in technical infrastructure (Zhao et al., 2002) see section 2.3.3.2 have reduced, although not eliminated. Technology is now standard in classrooms across all sectors within education. Nevertheless, there continues to be shortages or limited classroom access to technology (Plesch et al., 2013; Prestridge, 2012), this perceived barrier concerning resources was the first theme with three sub-themes to emerge from the interview data. The first of the sub-themes related to resources concerns access to technology.

Access to resources.

Teachers in the colleges perceived restricted access and limited resources to be a barrier to the integration of technology into their teaching practice. All the interviewees expressed concerns that lack of resources acted as a barrier to technology integration.

The following quote from Philip is representative of the interview participants and typifies the feelings of frustration with the lack of resources or access to resources identified by teachers in the colleges.

> *I would like to use it more, but don't teach in any computer rooms, computer rooms [are] few and far between. If I had a computer room, I would use all the resources online and that are out there. Not one Maths or English teacher has a computer room while the vocational staff float between them, but their resources and submissions are on the VLE. We have paper-based exams (Philip).*

Lynn also highlighted this issue.

> *I work in very few rooms with computers in, resources are limited, and [the] assumption is that every student is computer savvy and have personal resources to use. We don't have enough resources in terms of hardware to allow access for all the students (Lynn).*

Although technology was available, there was a perceived need to downsize or upgrade the type and specification. The specification and type of technology acted as a barrier to integration for some teachers in all colleges; the following quotes highlight the issue.

I think we could have more rooms kitted out, less so with desktops and start using smaller technology. I'd probably want more rooms to move over to that [smaller technology] now because I think that's [the] technology we've got [now] (Mike).

One of Mike's colleagues supported this observation concerning the type of technology available and the barriers it presents to their teaching.

I would have computers available for the students, but what we have [are] desktops, the kids have to look over the desktops to see the board, and it's very intrusive when you're teaching (Rose).

The nature of Vocational Education exacerbated the lack of resources with popular or high demand courses attracting high numbers of students leading to a scarcity of resources at certain times in one rural campus.

We have some large cohorts with 160 students and trying to cater for enough I.T. for those students to have it when they want it, even though we have lots of resources, it still is a challenge for planning and programming (Peter).

Financial constraints have resulted in a change in college management's approach regarding the provision of resources; Don identified this, but the issue raised concerns in other colleges from some of the teachers during the interviews.

I've been here, this is my sixth year, and most of the rooms were kitted out with electronic whiteboards that I presume had been in since the college started up (eight years previous). They've taken those out and replaced them with TV's; I don't know why that is, I don't know whether the contract that they had is up or whether they just became too costly to replace. I would guess that they'd be coming to the end of their natural lives, but yea last year or the year before there was a whole process of taking out the electronic interactive whiteboards and replacing them with TV's, it just acts as a monitor (Don).

One consequence of changes in the provision of resources by colleges has been an increased reliance on students having access to personal devices to supplement this lack of provision by the colleges. This situation has created another barrier related to lack of resources shown as the digital divide in the following sub-theme concerning resources.

Digital Divide.

The digital divide (section 2.4.1) describes the unequal access to technology which creates a gap between the “haves” and “have-nots.” Poor, less able or disadvantaged students are less likely to have equal access to technology, this has a knock-on effect on their ability to learn and develop (Clayton & Macdonald, 2013; Hohlfeld et al., 2017; Zhang, 2014).

One college faced this specific issue that acted as a barrier to technology integration when there were not enough resources supplied or available in the college.

> *The big elephant in the room is poverty; I work with refugees; I work with long term carers. Some of them don’t have smartphones, not in this area (Lynn).*

There was a level of consistency in the same college with another teacher expressing similar views that the digital divide created a barrier to technology integration.

> *If I use the phones in the classroom, some kids don’t have them, and I can’t always get my hands on a tablet to aid them so sometimes it can become exclusive. Some kids can almost be excluded from the activity unless they work with their friend using one phone between two, and that always doesn’t go down well (Philip).*

Limited access, as shown above, creates one set of barriers, but uncontrolled or uncoordinated access also creates barriers to teachers when trying to integrate technology into their teaching practice. The final sub-theme related to lack of resources is the disruption caused when students use or are encouraged to use personal devices to supplement the lack of resources available in the college.

Disruption from use of technology.

Continual distractions disrupt teaching and learning (Bellur et al., 2015; Fried, 2008). Potential disruption during classes caused by the use of technology was considered to be a barrier to technology use and integration by all teachers across every site. This situation worsened when there was a lack of resources provided by the colleges and a reliance on students having personal devices to supplement this lack of provision.

The following quotes are representative of the interview data and illustrate the concerns expressed across all colleges by all of the participants.

There is an issue with students using the mobile phones for other purposes than education. That is really the only negative, if students are using I.T. [for] the right purposes it is a benefit but [it] could be a nuisance and classroom management and discipline could be issue (Peter).

Students using personal mobile devices for none learning activities raised concerns from another teacher in a different college.

The risk is with the tablets and phones is that they are not doing what I am asking them to do (James).

The use of personal devices, it was suggested, had changed classroom dynamics and management.

Classroom management has totally changed, it has come from kids jumping on the tables and making a noise to this low level which is worse, so much worse, because they are like this all the time, [Looking down as if texting on the phone]. They're not noisy they are sitting there, they're quiet if you want them to be, but totally disengaged, and if you ask them to work on the computers I have to be standing at the back of the room, so you can see all of the screens because they are on Facebook or check their emails (Rose).

Nancy experienced students not using technology as she wanted when they were allocated work or tasks to complete but could easily identify when they were not working as expected.

You do sort of monitor, and I have caught them, I usually do a wander around, and it's when you see them sat smiling that's a giveaway, why are you smiling at a piece of research about death? It's a dead giveaway (Nancy).

5.2.1.2 Access to training.

Specific training in the use of technology for teaching purposes is important in determining whether teachers adopt and integrate technology into their classroom practice and lack of specific training can manifest itself as a barrier (Donnelly et al., 2011; Keengwe et al., 2008; Prestridge, 2012).

Zhao et al. (2002) identified this type of barrier as being within the context and teacher domains, while Ertmer (2005) considered this to be a first-order barrier. According to Jones (2004), teachers feel reluctant to use computers if they lack confidence. “Fear of failure” and “lack of technology knowledge” have been cited as some of the reasons for teachers’ lack of confidence in adopting and integrating technology into their teaching (Balanskat & Bleamir, 2007). Access to training was the second theme to appear from the interview data with two sub-themes identified by teachers as perceived barriers the first of which was the nature of the training provided as CPD and the second being the source of the training. All of the teachers interviewed highlighted the need for training in how to use technology for teaching purposes to be vital to its integration.

Nature of training provided as CPD.

When training is targeted and specific to the user in the context of teaching and learning, then it can be beneficial and informative and lead to teachers becoming positive and integrating technology in a way that many stakeholders envisaged as stressed by Rose who had undergone such a training programme.

> *I taught in America for a few years, and we went on a week’s training on how to use, prepare materials, all sorts of stuff using the whiteboard and I think that is the best thing anyone has ever done for my teaching and use of IT, because you don’t know it’s there unless you are pointed in that direction. I’m lucky because I had that experience so I can, I think I can use any whiteboard, but I know a lot of us do use it [only] as another powerpoint projector. I think I am able to use it a bit more than a lot of my colleagues; they don’t even try (Rose).*

The training provided during many CPD sessions did not prepare teachers to utilise technology in their classroom practice and as has been previously identified proficiency in using technology, in general, is a reliable indicator of technology use in the context of teaching and learning (Lau & Yuen, 2013; Messina & Tabone, 2013; Shawer, 2013). Teachers across all campuses and colleges identified lack of training in how to use technology in teaching as a barrier to technology integration.

> *The formal training I have had is on how to switch the whiteboard on and get things on there, so it's always a bit [of] trial and error really. We do get I.T. support if things don't work, but in terms of training; [it] isn't amazing. (James).*

The previous quote from James represents a general sense amongst the interviewees that training on how to use technology in teaching is essential.

> *I have had an hour training on the Itouch board, but you need a week or a fortnight on it possibly. [There is] training within the college, but not long enough to take it all in, lots of people say the same (Nancy).*

While teachers in the study stated that the training provided did not always satisfy their requirements, Mike did suggest the type of training that could support the integration of technology.

> *I would make sure that people were pretty well trained in up to date packages. I would give everybody a [personal training] strategy and say to them well think about those areas in your curriculum where you can integrate this and identify which ICT tool are going to be most effective (Mike).*

Teachers in the study not only identified the type of training provided as being a barrier to technology integration, but also the trainers conducting the training sessions as potentially creating a barrier.

Source of training and training providers.

It was not just the content and the whole group approach to training and CPD that concerned and discouraged teachers, the training format and timetabling also raised concerns and barriers. How CPD was delivered and when it was delivered concerned some teachers in different colleges.

Gill identified a detail related to CPD that concerned her and which acted as a barrier.

> *Avoid I.T. lecturers who make assumptions on peoples understanding, [provide] jargon-busting user-friendly sessions where people are not made to feel stupid because they are not technologically able (Gill).*

Lynn also raised the decisions regarding the type and delivery of CPD.

> *College CPD is mandated and not specific to the needs of teachers to address specific requirements. It's not a lack of training I think sometimes its' how the training is delivered. Sometimes we'll be talked at for an hour, but we won't actually do. It wasn't until you actually had to develop your own [material] that you were like, how the hell do we do this (Lynn).*

Gill went further and questioned the importance attached to CPD in general when it was not given a specific timetable slot and was delivered between the end of the teaching day and before the evening classes began.

> *If the college were to say this training is to be put on, they need to make it easy for people to access, give them the time don't make them stay from 4.30 – 6.00 for training sessions (Gill).*

Don raised the issue of the importance attached to technology related CPD specifically when he observed.

> *I don't think that it's [I.T.] got the same profile as it had, I think that maybe it's declined and I don't know, there might be more of a thing now where people just assume that you know, you know it might just be my perception, but I think if we sort of rated where IT was on the importance agenda if you like, I think it's probably fallen down it's probably to do with just maybe we take it for granted now (Don).*

The previous section has identified many different perceptions of teachers in the study that CPD involving technology is not specific to the effective integration into their teaching and delivery. An additional barrier was the lack of adequate technical support.

5.2.1.3 Lack of Technical Support.

Recurring technical maintenance, upgrades, faults and equipment malfunctions lead to lower levels of technology use by teachers. Technology failures, or the expectation of failures occurring during lessons, are likely to reduce teacher confidence and cause teachers to abandon technology in future lessons (Buabeng-Andoh, 2012; Jones, 2004, Snoeyink & Ertmer, 2001). Lack of technical support was identified as the third theme from the interview data with two facets perceived to act as a barrier to technology integration. These sub-themes were presented as the I.T. support that was available to teachers and an additional barrier created due to having to share resources among different teachers and courses within the college.

Zhao et al. (2002) identified lack of technical support as a barrier aspects of which were within both in the teacher domain and the project domain while Ertmer (2005) considered lack of technical support to be one of the first-order barrier to technology integration.

I.T. Support Available.

All colleges had internal I.T. departments that provided support for technical issues, faults and breakdown of equipment, the support was limited to addressing these technical breakdowns, but there were differing perceptions of the effectiveness of the support available. Ray indicated that this type of support was not sufficient and did not enable him to use interactive software because the level of support needed during its use was not available.

> *I'm thinking of running a Jaguar programme, but need an I.T. technician that knows it and is on hand when things go wrong, it's a collaboration with IT support, but we don't have that. They're very good, they always come along and try to fix something, but they are under a lot of pressure, A lot more support is needed on the I.T. front (Ray).*

Main college campuses did have greater access to I.T. departments when they needed it, because of the centralisation of the support functions in colleges, as shown by the comments below from teachers in two different main college campuses.

> *We do get IT support if things are dead if you switch a button and nothing comes on, but you only have to make one phone call, and they'll be out to sort the volume*

out or sort the sound out, if there's a hardware issue rather than enhancing your teaching (James).

This perception of the technical support available appeared to be consistent with other colleges where teachers worked in centralized campuses.

There is this support in the background, if you're struggling somebody will be there to maybe, give you a hand, so it's only a phone call or an email and they're happy to support you with anything really (Nancy).

Nevertheless, lack of support was difficult to address when teachers were working in satellite campuses where they perceived they were more isolated and lacked the necessary access to help.

We have limited support from IT because the team is not very big and they have a big workload with all three sites; we had support all week during Ofsted. They try most of the time to get us a techie for the morning. Doesn't always work because the team isn't very big (Gill).

Shared Resources.

Teachers perceived that shortage of staff in the I.T. departments but caused issues that acted as barriers. The workload within the I.T. departments determines the performance of the technology in the classroom and unscheduled upgrades, breakdowns and shared resources can create barriers for teachers. The following quotes reflect the concerns of teachers taking part in the study in two of the colleges.

Generally, it's quite good and reliable. We have to share classrooms so it may not always be working or able to work. We have no set rooms we might be in a classroom that we haven't been in since last week. Computers do upgrades at any time [its] not planned to be done out of teaching time because they are turned off [after each class] (Don).

The problems caused by sharing resources, highlighted by Don, was perceived as a barrier for Ray, in a different college, he noticed the differences with his previous experiences in schools.

As a schoolteacher, your interactive whiteboard is yours; your classroom is your domain, you manage it, nobody else is going to come in there and mess it up.

Whereas here because all classrooms are used by all manner of people, things go wrong here a lot more with the IT. I've got a room at the moment which I've had [to] unplug it [I.T.] because it's doing all sorts of weird things and stopping me teaching (Ray).

5.2.1.4 Absence of Pedagogical Support.

A lack of support from dedicated, specialized staff experienced in integrating and using educational technologies in different subject areas that are capable of identifying and implementing effective digital pedagogies acts as a barrier to technology integration (Akcaoglu et al., 2015; Cárdenas-Claros & Oyanedel, 2015; Goktas et al., 2013). Absence of pedagogical support was the fourth theme to arise from the interview data and was perceived to be a barrier for teachers in the study.

Zhao et al. (2002) considered this type of barrier as being within the realms of all three domains, within the teacher domain it was a barrier due to an incompatibility with the teacher's pedagogical beliefs. It reflected n the project domain as the distance the project deviates from the dominant set of values, pedagogical beliefs, and prior educational practices and experiences of the teachers. Within the context domain, the barrier sat within the human infrastructure. This barrier could be reduced or eliminated by having flexible, responsive and identifiable people who can help the teacher understand and use technologies for their own classroom needs. Ertmer (2005) identified pedagogical beliefs as a second-order barrier.

Previous research identified the timescale and commitment to specific CPD related to classroom practice and pedagogies required to integrate technology into teaching practices effectively (Carlson & Gadio, 2002; Marcinkiewicz, 1993). The scarcity of support and time to integrate technology effectively has resulted in a situation where classroom practices have remained largely unchanged (Akcaoglu et al., 2015; Shin, 2015).

The interviews identified the need for support and CPD directly related to the use and integration of technology for teaching in the classroom. Teachers in the study were consistent in their identification of the type of specific support that they perceived would enable them to integrate technology into their teaching practices effectively.

When I arrived here, we had a member of staff who would give help and advice and support, and he used to do a lot of the staff development sessions. I don't think that [I.T has] got the same profile as it had. I think that maybe, there might be more of a thing now where people just assume that you know. Someone who you could *turn to, maybe that's the sort of role. Maybe [it's] the bridge, I would like to see that role because there are people who are not quite so savvy who just think well I wouldn't have a clue so I'll not do it. I'll just do what I've done, stick with what they're comfortable with (Don).*

There was a high level of consistency supporting this perception and identifying affirmative action that could be taken to improve technology integration.

There aren't many that are leading the field, the one person who was leading the field, happens to be on long-term leave at the moment, so in terms of this campus one of the people who would be actively searching some of the best new resources he's not in the loop now, so I think we are probably missing out just a little bit there (Peter).

The support needed should not be limited to providing CPD sessions of limited duration on generic subjects, the majority of teachers felt that CPD and pedagogical support should be on-going, helping teachers to upgrade their skills continually with the support of designated personnel.

I'm I.T. literate but need support on the modern aspect of things apps, programmes, but teaching with it is harder. I feel like walking a tight rope, and it could go wrong at any moment. If I was using something new, I would need lots of support (Philip).

The pace and perceived continual change in technology was also considered to be a demotivating factor for Lynn.

It seems to be you just get use to one thing, and suddenly it's out of date and not acceptable or not de rigueur (Lynn).

5.2.1.5 Shortage of Time.

Teachers in post-compulsory education have many duties and responsibilities in addition to teaching including preparation, marking, mentoring, counselling, as well as CPD and meetings of various types (Feather, 2017; Tummons et al., 2013). The perception among teachers is that the integration of technology has added to their workload; converting teaching materials to a format compatible with the technology used, course maintenance and upgrades associated with the VLE, responding to student emails and the need to learn new skills Samarawickrema & Stacey (2007). Many teachers feel overwhelmed, and this acts as a barrier for them.

Ertmer (1999) see section 2.3.3.1 determined that lack of time was a first-order barrier while Zhao et al. (2002) see section 2.3.3.2 categorised lack of time as being within the context and project domains.

Teachers have reported they are unable to find time to be able to use or explore the potential of the technology considering the intensity of the curriculum. Performance-based management and a culture of internal and external auditing has added to the teacher's workload with constant demands for information (Bailey & Colley, 2015). As a result of these demands, teachers are working consistently over hours, with work spilling over into personal time, including holidays (Avis et al., 2001; Jephcote et al., 2008).

Lack of time was perceived to be a considerable barrier to technology integration by all teachers in the study across all campuses. The quotes selected from Ray, Nancy and Gill, are representative of each of the interviews.

> *What I need is time off curriculum, instead of teaching then meetings and CPD the government keep throwing at us. For the last five years you're just pushed into the ground constantly, we do cover, we do our own invigilation, we have to do advice and guidance some evenings, there is a lot of admin to save money. I don't feel the staff get the time to do this professional[ly] (Ray).*

Even when teachers are confident and very proactive in the use of technology in their teaching, as is the case with Mike and Nancy, they still feel as if they are under pressure from the workload they are expected to fulfil as stated by Nancy.

> *There is a heavy workload with marking, delivery and planning; it can be very time consuming to change [materials] to powerpoint or prezzie, just give me more time*

to learn and understand. I think it's time-consuming, I mean I'm not full-time I'm 0.7, so I do work from home quite a bit, I am a bit of a workaholic, so I put my own time into learning software and technology and trying to embed it the lesson (Nancy).

All participants supported this perception, and it was not confined just to one campus or college, but Gill made a more personal plea.

We're all very time-constrained this is a very time-consuming job it is not just the hour teaching in the lesson it's the marking, it's the planning, don't make me use any more of my own time please (Gill).

5.2.1.6 Infra-structure related barriers.

Although progress has been made, through investment both internal and external to the colleges, there are still issues surrounding infrastructure reliability with slow bandwidth and internet speeds during peak demand times impacting directly on teacher's willingness to integrate technology into their teaching practices. Technology reliability is a first-order barrier (Ertmer, 2005), see section 2.3.3.1, and as a barrier within the context domain (Zhao et al., 2002) see section 2.3.3.2.

Issues surrounding the reliability of the technology infrastructure result in teachers preparing lessons in the expectation that the technology will fail, which leads to the duplication of work and an increase in workload (Neyland, 2011). All of the teachers interviewed in one college, experienced issues related to the infrastructure; the quotes below illustrate some of the frustrations.

Doesn't always go well, I find sometimes the slow network speed does frustrate me a little although I do usually have a back-up plan in progress (Mike).

The complex mix of technology that interface in colleges means that at some point, some part will fail in some way and cause disruption to the class.

When you have somewhere like this, where there is a large I.T. infrastructure, things go wrong all the time. When you're dealing with these sorts of things a lot can go wrong, and I think our server, infra-structure, upgrading to Windows 10 there are a lot of variables (Ray).

This perception gained support from teachers in other colleges,

> *The internet goes out, or the wireless goes out, but that is reality, this is how it is, I tend not to use it on a regular basis because you can't rely on it 100% of the time (Gill).*

5.2.1.7 Summary

The barriers identified and discussed thus far are extrinsic, measurable, and through procurement and investment have been reduced. There does remain though deep-seated extrinsic barriers related to the use of technology in teaching and learning. The barriers identified from the data, obtained through the interviews confirmed many of the aspects that had been identified by previous research from other sectors of education (Ertmer 1999; Zhao et al., 2002; Shin, 2015; Scherer & Siddiq, 2015).

One barrier in one location related to lack of resources provided by the colleges and was specific to a low socio-economic area. This barrier is related to what has been termed the digital divide. Another barrier to technology use resulted from the nature of Further and Vocational education. The allocation of and access to resources is determined mainly by college management on the basis of the subjects taught and the assessment methods used resulting in Academic subject areas, with traditional paper-based exams, having very limited access to resources when compared to Vocational subject areas that use technology to distribute materials and complete assignments via the college intranet of by using a VLE.

The data identified that teachers perceived that lack of time acted as a barrier to integration, as the shift in management practices in colleges meant there were now greater demands on teachers. Teachers were expected to undertake many additional roles in addition to teaching; teachers in post-compulsory education teach a higher number of contact hours than any other sector and have less time for additional activities like learning to use and integrate technology.

Measures have been taken to reduce extrinsic barriers through procurement of technology, as identified from the interview data; nevertheless, they do still exist. Much harder to address are intrinsic barriers, these barriers are the result of conflict with the fundamental beliefs of teachers, these beliefs are prone to change depending on the context or situation and teacher's perceived self-efficacy or self-confidence in using technology.

5.2.2 The intrinsic barriers to technology integration.

More significant than the extrinsic barriers are the intrinsic barriers, identified as the ‘real gate-keepers' to the integration of technology. Intrinsic barriers embrace the core beliefs and values that teachers hold; many of these are central to what the purpose of teaching is. These barriers are more difficult to address as they are individual, personal and liable to inexplicable change (Blackwell et al., 2013; Ertmer & Ottenbreit-Leftwich 2013; Howard, 2013). The integration of technology is far more complicated than just "some technical skills and a good attitude" (Zhao et al., 2002, p.511), the fundamental pedagogical beliefs of teachers will determine the style of teaching that they adopt in the delivery of classes (Bandura, 1986; Clark & Peterson, 1986).

In this section, I will present the data related to the intrinsic barriers as reported by the teachers taking part in the study. Intrinsic barriers discussed previously, see section 2.3.3.1 and section 2.3.3.2, have a significant influence on effective technology integration into teaching practice. Self-efficacy or teacher proficiency (Bandura, 2006) has been identified by Ertmer (2005) and Zhao (2002) as an intrinsic barrier and is considered a critical component for the integration of technology (section 2.4.8).

Two main themes developed from the interview data that related to intrinsic barriers these were efficacy in the use and integration of technology and core beliefs held by teachers regarding technology integration and the effect that they have on teacher practice. Within the efficacy theme, there were two sub-themes related to teacher self-efficacy and the efficacy of teacher's colleagues. The theme of teacher core beliefs had five sub-themes related to the core beliefs of teachers regarding technology use and integration. The following section presents the results from the interview data related to teacher's perceived efficacy in technology use.

5.2.2.1 Teacher self-efficacy in using technology.

Self-efficacy has been defined as “the belief that one has the necessary skills and abilities to perform the behaviour" (DiClemente et al., 2009, p.218). Self-efficacy theory proposed that certain behaviours will lead to certain outcomes and shows the individual’s expectation of personal success (Bandura, 1977, 1982; Maddux et al., 1982). Three different sub-themes arose from the interview data surrounding the issue of self-efficacy, the first of these concerned the establishment by teachers of boundaries and limits in their technology use. There were several different perspectives presented by interviewees regarding the boundaries that were established by the teachers and how these boundaries acted as barriers to technology integration.

Boundaries.

All the teachers in the study stated that they were confident and used technology for tasks and functions that were familiar to them. Confidence level and the use of technology were perceived by teachers to have many different strands and reflected in the quotes below. Confidence and experience were linked to technology integration, as expressed by James.

> *Moderately confident, that comes from experience, in the early years, I felt quite fearful, but years of experience got me over that, other people get stressed about it. (James).*

Ray stated that familiarity with the technology was key for him, due to the culture that existed in colleges.

> *I am fairly confident, I know what I’m doing and its self-protectionism when it comes to teaching and being confident with what you are doing, you use the packages you’re used to (Ray).*

Boundaries were a consistent theme throughout the interviews, interviewees in all colleges stating that they recognised their limitations and capabilities when using technology. There was an overriding impression given that the teachers in the study were determined to remain within the boundaries that they established; these boundaries were in effect the barriers for them to greater integration.

I think in general I'm OK I don't take the lead, I am not averse to using technology; however, I am not knowledgeable enough to be in the forefront. Some things I find more difficult than others, I can't use Excel very well, I use what I'm familiar and comfortable with, and that's the boundaries (Rose).

Teachers were confident and competent in using technology that they were familiar with and had learned how to use well; there appeared to be little desire to experiment. Peter best summarised the overall perception of teachers in the study.

When I use computers, and I'm not shy of computers, I usually feel happy what I do use, is tried and tested, I use it for a purpose and don't use it begrudgingly. Anything I do use it has a set role within the lesson, and I'm very comfortable with it (Peter).

The previous quotes demonstrate that teacher confidence in using technology had clear boundaries defined by the teachers, but some teachers expressed a higher degree of self-confidence. Nonetheless, it did not always lead to a greater use of technology; confidence became the second sub-theme within self-efficacy.

Confidence.

A more valid indicator of a teacher's degree of efficacy was evident through the level of engagement that teachers showed. Not all the teachers in the study remained within the boundaries of comfort; some were prepared to explore more possibilities. Nancy and Geoff, two of the more confident teachers when using technology, showed a different level of commitment to use technology than most other teachers in the study.

I always have a powerpoint there, linking to videos and software to introduce gaps and questions [and] used virtually all the time. I'm self-confident, the college gives support when necessary I'm no expert, but I am confident and can work out how to use a piece of software and integrate it into a lesson (Nancy).

There were similar sentiments from Geoff, who was considered by colleagues to be a champion within the department.

Generally, I can do pretty much everything I want to, and I'm confident I can learn anything I want to. I use ICT in every lesson in every session. I take the lead in my team; I am the person who shows others. I guess I am the person that others would

> *ask how to do things. If it is something to do with a classroom thing, then they would ask me. I feel confident using ICT in class. (Geoff).*

Self-confidence and self-efficacy though were no indicator of technology integration when most interviewees remained unconvinced of the benefits and improvements that technology could bring. The following comments from Gill and Philip reflected a position that was consistent throughout most of the interviews across all the colleges.

> *I have at times been a leader, I fully embraced it, and I had to drag my team into the 21st Century, kicking and screaming, about computers. If the college in its wisdom decided that from tomorrow all teaching had to be done via technology I could do it, I don't think it is an effective use of my skills, however but I could do it, I can produce very decent power points even with all the whizzy bits, I don't like it, but I could do it (Gill).*

This perception found support from other participants and was not confined just to one campus or college. Philip questioned the need to change.

> *Why is it being imposed on people who are getting results in their own style, so is there a need to impose technology on them just because other people are doing it that way. As long as it is not adversely affecting a lot of people allow them to do it (Philip).*

The final sub-theme related to the self-efficacy of teachers raised the possibility of the pace and perceived constant change creating barriers because of teacher's inability to understand and master technology, that quickly becomes outdated and redundant.

Constant change.

The speed and constant change of technology was perceived to be affecting the confidence and self-efficacy of teachers resulting in increased levels of anxiety and stress Betoret (2006). Teachers from all colleges suggested that constant change acted as a barrier to integration; Don highlighted this point.

> *I have confidence using IT, certain things I am not up to speed with, but things change so fast you can't always know everything. I always have at the back of my mind what happens if it doesn't work (Don).*

There was a degree of consistency across all colleges that supported the perception that the pace of change affected teacher's self-efficacy, as shown by Lynn.

> *I think technology changes so quickly it is hard to be very confident. ICT is constantly changing, and I feel I never know programmes 100%. When I know the programmes, I am comfortable with it (Lynn).*

Teachers that taught I.T were not immune from the feelings of constant change, creating barriers as Mike stated.

> *Yes, I'd hope I'm quite confident with that anyway, we do have a lot of software come our way at any one time I sometimes wish I could use it all perhaps that little bit more effectively I just want to be more on top than I am (Mike).*

Having examined teacher's self-efficacy, I wanted to explore how the teachers in the study viewed the efficacy of colleagues and their engagement with technology.

5.2.2.2 Perceptions of colleague's efficacy.

The teachers were willing to share their observations of colleagues and how they use technology in teaching and learning. Even when technology is available, there is no guarantee of its use, with teachers in post-compulsory education being perceived as slow to adopt new ideas and regimes (Orr and Simmons, 2010). There was a perception that some teachers were not willing to utilise technology in even the most basic way and avoided its use altogether.

Geoff identified that some colleagues shunned technology completely, not just in their teaching practice.

> *There are some staff who don't even read emails and admit that they don't. Integrating technology through mandating training or [demanding] that ILT must be included in the classroom, it doesn't seem to work. I guess it is really if you are interested in using technology (Geoff).*

Some teachers observed that colleagues were not willing to attempt to integrate technology into their teaching.

> *A lot of my colleagues don't even try. Some are really good, but I might be in my department, maybe one of the very few, I don't want to say the only one who uses a smartboard completely (Rose).*

The interview data showed that teachers used technology within boundaries that they established and set and were comfortable operating within. When the teachers in the study discussed their colleagues use of technology, they identified that some teachers would not use technology even for task unrelated to teaching practice. The second theme related to intrinsic barriers was core beliefs; it was necessary to investigate and discover the core beliefs of teachers; the results of interview data are in the following section.

5.2.2.3 Core Belief.

Policymakers and government actively promote the belief that teaching is undergoing an evolutionary change, shifting decidedly from a teacher-centred to a student-centred activity. In practice, established curricula and teaching approaches remain virtually unchanged with technology being underused and poorly integrated into the classroom (Akcaoglu et al*.,* 2015; Shin, 2015).

Teacher's fundamental beliefs and attitudes about the integration of technology form part of what Ertmer (1999) termed second-order barriers see section 2.3.3.1. These are the real gatekeepers to technology integration and use. Zhao et al. (2002) considered these barriers to exist both within the teacher and the project domains. The barriers were related to teacher's pedagogical belief and proficiency and are affected by the dominant culture in the college and practices of the individual teacher.

In this section, I present the data that relates to the core beliefs that teachers in the study identified as potential barriers to technology integration. Five sub-themes developed from the interview data, and that I categorised as relating to teacher core beliefs, the first of these is a belief that the age of the teachers influenced technology integration.

Impact of age.

Teachers across all colleges suggested characteristics such as age and teaching experience would determine how technology was adopted and used in their teaching practice. The quotes below are representative of many of the perceptions voiced during most of the interviews across all colleges. Interviewees raised age as potentially being a factor that led to the creation of barriers, however, previous research (Scherer & Siddiq, 2015), concluded that demographics were not a determining factor in technology integration see section 2.5.

> *My position on this is potentially something to do with my age I am fairly old school as a teacher, I have been in education since I was 16 and I have grown up through most of my career with my pen and my board, and that is my entire comfort zone in the classroom, I don't mind them [students] using their phones to research I don't have a problem with any of that, our registers are all taken via tablet these days, so I think it is really more me and my head and where I am. (Gill).*

Philip supported Gill's comments when suggesting age might have some influence.

> *Yea I suppose there are certain things within IT, that would probably, I don't know if it's an age thing I don't know, would probably make me nervous (Philip).*

Role of technology.

"Research offers little support for the popular (though perhaps unrealistic) rhetoric about technology revolutionizing teaching." (Hennessy et al. 2005 p.156; Liu, 2013; Underwood & Dillon, 2011). Technology primarily remains viewed as a useful tool that is used to support traditional teaching approaches (Ertmer & Ottenbreit-Leftwich, 2013; Hernández-Ramos et al., 2014). Liu (2011) maintained that 80% of teachers use lecture-based teaching with technology while others demonstrated that teachers preferred to use traditional teaching methods (Plesch et al., 2013; Scherer et al., 2015).

The second sub-theme connected to core beliefs was the belief that technology added to the existing repertoire of teaching techniques that teachers possessed. Many participants viewed technology as part of their teaching toolbox rather than a significant deviation from existing practice. The suggestion was that technology could enhance delivery by enabling a blend of approaches to teaching and learning within their classroom practice (Ertmer & Ottenbreit-Leftwich, 2013; Hernández-Ramos et al., 2014) see section 2.4.9.

I.T. is a tool to help you as part of your toolbox, I use it as a tool to get ideas across, and I'm not pushing kids with it either. I use it as a teaching tool. I am fine with it, but I'm not leading people, I don't champion it (Ray).

Some of Ray's comments were echoed by Don who viewed technology as an additional tool to be used when appropriate.

I use IT selectively; it is part of a teaching toolbox. It is one of the many things I will use, but by no means exclusively (Don).

There was a level of consistency supporting this perception as well as identifying the positive contribution technology could make to teaching practice as Peter states.

Computers have a useful role in the teaching, and I find the technology really good in terms of showing some really good images, Youtube clips and videos and re-caps. It definitely has a place (Peter).

Lack of depth in learning.

The methods employed by teachers will depend on their view of how learning is achieved (Conole et al., 2004; Trigwell & Prosser, 1996). Technology use raised concerns among a small number of teachers in two colleges regarding the depth of learning. It was perceived that using technology promoted surface learning.

I don't think it does them [students] any favours I find critical thinking is going, because they don't have to think any more, you type the question into Google, and you get an answer, they don't even critique the answer. They're getting so you know, you kind of ask a question in class if you are not careful what you get is a response from Google so that they haven't even thought about the question they just want to hear the question and they regurgitate an answer which they found online (Rose).

Peter supported this view, and they also questioned whether students were fully engaged with the learning process.

I think some students become too reliant on thinking I don't need to know anything I can look it all up. I'm not convinced, I think many things can be researched, but if students just think I will go and look it up it doesn't engage with their brain in the same way (Peter).

Participants' delivery preference.

Whether technology is integrated and used by teachers in their classroom practices will depend upon the fundamental beliefs' individuals hold over the effectiveness and benefits derived from its use. The technology adoption model proposed by MacCallum et al. in section 2.4.5 identified factors that determine if technology is adopted or rejected in practice. The beliefs that teachers hold regarding what constitutes teaching and how best this is achieved are the most crucial considerations see section 2.4.9, and from the interview data, teacher preferences became the fourth sub-theme related to teacher core beliefs. The quotes presented offer some of the perspectives that reflect the variety of perceptions held by teachers that affect technology integration in their practice.

I strongly, strongly believe in still using the textbook because that's what we have, learn how to read, gleam correct information and the information that you need from what you have read. Be able to understand the information that's in front of you and then be able to use that information for us now to answer questions. I don't use ICT exclusively. (Rose).

The style of teaching adopted is influenced not only by the beliefs of the teachers concerning the delivery; Gill raised the issue of subject area determining delivery style.

I think with early years there is a lot of hands-on stuff and I am a kinaesthetic learner, and we have found over time and research that the majority of early years practitioners who come are also kinaesthetic learners', so we are all very hands-on, it's is a very hands-on profession... It's not a requirement to be a good teacher to be technologically able (Gill).

Garry suggested that imposing technology on teachers does not take into account the fundamental way that some teachers view teaching.

I am aware of staff who are very challenged when it comes to ICT, I worked in a community centre without access to a whiteboard or projector, if I had [to explain] *what I was doing using a flip chart I would have said like a powerpoint, but on paper, some staff here would say [powerpoint is] like a flip chart, but on the computer (Garry).*

Don suggested that teacher's core beliefs will always determine the level of integration and use of technology. He summed up the concerns of most of the teachers in the study regarding teaching and delivery.

There are people who are not quite so savvy who will just avoid I.T. and stick with what they are comfortable with. They don't have the expertise to solve potential problems, so avoid the situation that might cause that problem (Don).

When there was little or no active monitoring of technology use by teachers in any of the colleges, personal choice or preferred delivery style often dictated classroom practice.

It's not consistent in college we have some teachers that still use OHP's and acetates, on some courses (James).

During the interviews, no particular demographic identified as being resistant to technology integration, and as noted by Nancy, it seemed to be determined primarily by personal preference and choice.

It is not just age we've got another young guy in the department, and he's not that struck on powerpoint, I think it is more just personal preference and your teaching style it boils down to. I have some colleagues who don't even turn the IWB on; it is down to each individual as to whether they use it or not (Nancy).

Personal preference has a considerable influence on classroom practice, the beliefs concerning what constitutes teaching and learning will have a dramatic impact on teaching style and willingness to change from a method that has probably developed over the years. However, teachers were able to identify situations where technology had made an impact in areas of their professional lives even if they also raised caveats.

Impact technology has in the classroom.

Hattie & Yates (2013) suggest teachers seem to fluctuate in the views and beliefs they have about technology, never quite seeming to decide on the value that technology can bring to teaching and learning (section 2.4.5). Given below are a sample of teacher's views showing a high degree of consensus and caution associated with technology use from the interviewees.

> *I think it's [technology] made a phenomenal difference, but has it made the kids any smarter? I.T. yes it has revolutionized teaching of course it has, but it can be used badly as well (Ray).*

Aspects of this apparent conflict centred around the results that technology can achieve as alluded to in section 2.3.2 and additionally, the expectation of others that technology was used, or seen to be used, in class.

> *I use ICT in every lesson, I'm not sure it drags the students up or anything like that, but it's just another way of delivering certain things. I feel it is a bit of a balancing act while using it in the classroom, are they getting what I want them to get from it. Am I just showing them a clip from the Open University website, am I getting more out of it than them, it has to be effective, so it's a balancing act. I do what I am asked to do (James).*

The internal conflict and hesitancy teachers showed, centres around whether technology can achieve what has been claimed by others Hennessy et al., (2005). There were areas of real consensus among the teachers regarding lesson preparation and research capabilities, as shown by Gill and James.

> *To research and prepare it is the best thing since sliced bread, what would any of us do without Google (Gill).*

James and other teachers confirmed this to be a benefit when attesting to the usefulness of technology.

> *There probably isn't a teacher today that doesn't use technology to prepare lessons or for administration purposes (James).*

All of the teachers interviewed recognised the potential and possibilities that technology could offer, but these positions were tempered by an almost innate caution that inhibited them from whole-heartedly accepting all of the claims made in some quarters (Howard, 2013).

> *It has massive advantages, and if it is used correctly, it has massive potential. I think it can add to students learning and achievement, if used appropriately. I don't*

think it's the best thing since sliced bread and I'm not a technophobe. At one time, it was seen as a solution for everything rather than seeing it as a tool that can be used in certain areas, and it might be effective (Don).

Despite what appeared to be an innate caution, this did not come across as being negative; the data showed that teachers remained positive and were willing to use technology where they could see a benefit, many of the interviewees shared the opinion of Nancy and Peter reflecting the benefits and possibilities offered by technology.

The best thing since sliced bread, I like it, and it's fantastic. I like looking around for software to use. I am happy when I am using ICT in class; it makes it more interesting (Nancy).

A similarly positive comment from Peter promoted the heightened level of engagement from students.

It does engage the learners and effectively makes the links between the theoretical and practical parts of the subject. You can show, and students are more likely to have meaningful opinions if they just don't see text, they actually see an image, images can be a good starting point for discussions. I think the effect of ICT has been positive. I have embraced it from the start, and my teaching is definitely better as a result. Given that the students are so IT savvy and with smartphones and whatever, there's no you can't, and you couldn't, you wouldn't want to turn the clock back (Peter).

Summary.

Intrinsic barriers embrace the core beliefs and values that teachers hold. Many of these beliefs are central to what the purpose of teaching is. Two main themes surfaced from the interview data that related to intrinsic barriers; efficacy in the use and integration of technology and core beliefs held by teachers in the study consisting of five sub-themes that were perceived to shape technology integration in teacher practice.

There were two components within efficacy shown from the interview data; the first was teacher self-efficacy the second was observations regarding colleague's efficacy. All the teachers interviewed believed that they were competent in using technology, but the level of self-efficacy was directly related to and remained within clearly defined boundaries that the teachers set for themselves. The boundaries varied in the level of integration and differed between individual teachers. None of the colleges had a programme of training to establish and develop the skills of individual teachers, and as a result, the level of integration remained within the boundaries and comfort level established by the individual teacher.

Constant change and the speed at which technology and programmes changed was deemed to be a barrier to effective integration. Teachers perceived that they would never be able to understand and utilise technology with complete confidence. Teachers suggested that there was no obvious process to identify and evaluate software packages before there adoption, leading to problems for the teachers when they were expected to use them. The teachers in the study used technology, albeit at varying level of integration, but there remained other teachers in the colleges who were unwilling to use technology in any form and avoided its use completely.

The possibility of the age of the teacher being a barrier to technology integration was discussed and analysed from the interview data. Three of the teachers suggested that their age might act as a barrier to technology integration, this perception was not shared by other teachers in the study and supported previous research by (Scherer & Siddiq, 2015) that found demographics was not an indicator of technology integration and use.

The teacher's perception was that technology was an addition to the teaching toolbox rather than a significant deviation from their existing practice. Personal preference and delivery style continue to have a considerable influence on classroom practice, when technology was integrated it within the bounds of traditional teaching methods that remained relatively unchanged, as Liu (2011) stated. A small number of teachers identified concerns about the depth of learning, and this acted as a barrier to them. Teacher’s core beliefs will determine the level of integration and use of technology and summed up the concerns of the majority of teachers in the study regarding teaching and delivery.

5.3 Role of & Engagement with Technology in Teaching Practices.

5.3.1 How technology is used by teachers.

Policymakers and government actively promote the belief that teaching is undergoing an evolutionary change, shifting decidedly from a teacher-centred to a student-centred activity through the integration of technology. In practice, established curricula and teaching approaches remain virtually unchanged with technology being underused and poorly integrated into the classroom (Akcaoglu et al., 2015; Shin, 2015). Although previous research indicated that little had changed fundamentally in classroom practice, it was necessary to examine more closely how teachers in the study utilized the technology.

The interview data showed that all teachers engaged with technology in their teaching practice to a greater or lesser extent. There were high levels of consistency in responses, and the over-riding perception regarding engagement with technology from the teacher's perspective was thought to have been from the use of presentation tools like Microsoft Power-point, this type of engagement will be presented in the first section below.

Delivery with Power-point.

When interviewees were asked to discuss their engagement with technology in their teaching practice, there was an overriding assumption from them that technology use was about using Microsoft Power-point or similar presentation tool despite there being no specific mention of these teaching tools from the interviewer. It is clear from the representative quotes below that technology use in teaching practice was primarily perceived by all of the teachers in the study to be related to how they used presentation tools like Microsoft Power-point during classes.

> *There is an over-emphasis on the use of Microsoft powerpoint but having said that doing a Microsoft power-point is probably going to be more useful for the kids to see what's going on than doing something on the board. We are powerpoint driven; I hate to say. It has become formulaic, there is a process of powerpoint making, I think most teachers in the Maths department, we all use powerpoint, and that's the main way, and without it I think we'd be stuck. (Ray).*

Don referred to his previous experience at a different college where powerpoint materials were purchased to provide a level of standardisation and uniformity.

We actually bought a lot of interactive powerpoints which were already written, which we then used, which we could use in conjunction with electronic whiteboards. So [you] could say here's a jigsaw puzzle match these two equations, I used to like to use it for things like the graph drawing [be]cause it makes it so much easier than for me to draw a graph and then spend the next twenty minutes sort of knocking something up very crudely on the board where you can do it where they can interact as well (Don).

Ray and Don's comments reinforced the perception that the classroom remained mostly unchanged from the traditional 'chalk and talk' with powerpoint presentations taking centre stage in what is still a teacher-focused environment. When Geoff discussed the use of technology in teacher's practice, he too perceived this to mean powerpoint, and although he stated he did not use it himself, he noted that it was the main tool used by his colleagues.

I don't use powerpoint, but colleagues use powerpoint for every session, for every day, every activity, but with teaching, you're always on your own how do you know what others are doing (Geoff).

Hernández-Ramos et al. (2014) stated that when teachers identify an application that could add to their teaching, then they are willing to integrate and use technology. Nancy felt the benefits of using technology and was able to search for new resources although, she also acknowledged she did this in her own time, see section 5.2.1.5.

I like looking around for software to use. Use mind-map and use a lot of visuals in the powerpoint. I always have a powerpoint there, linking to videos and software to introduce gaps and questions. It can be very time consuming to change to powerpoint or prezzie, but I like using ICT and can't see me going back to using whiteboards because I can write on the IWB (Nancy).

Powerpoint, being perceived by all teachers as a primary use of technology for classroom delivery, was identified by Gill as having the potential in itself to act as a distraction during delivery.

I can produce very decent power points even with all the whizzy bits, I don't like them, but there you go. I like static ones, but I think it distracts from the information, flash in, flash out, the builder ones where there's animation. If people are looking at these little squares coming together to make a whole picture on the screen, they're not looking at the information, is my feeling on that (Gill).

The quotes above clearly show that powerpoint was the dominant delivery method for teachers in the study. However, some teachers were looking to use technology in other ways, as well.

Other uses of technology in classroom practices.

Many of the teachers across all colleges also used other tools and techniques during their teaching. The idea of using different methods within the same lesson was thought to be a positive way of utilising technology within a traditional approach.

> *I use ICT in every lesson, but it's just another way of delivering certain things, I use it every lesson, but only when I see it fit. It's a blended approach I suppose, I test and set homework using technology watching the iPlayer and then ask questions in [the] following lesson (James).*

Peter's comments showed that technology had much more to offer than just being a presentation tool when integrated effectively.

> *I find the technology really good in terms of showing some really good images and Youtube clips and videos you can show. Students are more likely to have meaningful opinions if they just don't see text; they actually see an image; images can be a good starting point for discussions. My colleagues use powerpoint extensively; there are the ones that are a bit more interactive, sometimes we use technology for setting up quizzes that self-mark and do checks. Powerpoint is for transfer of information, but we use videos and interactive power-points. We use Moodle and put extra resources on there, and students have the option to correspond via Moodle, some staff engage with that more or less than others. (Peter).*

When faced with learners of lower abilities and individual needs, then technology enables teachers to engage with learners in other ways that offers flexibility in delivery. Gill and Geoff from different colleges, demonstrated how technology could be used to overcome barriers to learning for some students.

> *I use a tablet, I use the computer I do use the IWB, I personally don't use power-point, I know how to do it, but don't use it. I teach a special needs group, and I wouldn't be without Google and Google images because three out of the group*

have no writing ability at all, but they do have reading ability so I use images and they match it to words (Gill).

The same techniques were used by Geoff in a different college in his classes with low ability learners.

I use images to teach the meaning of things rather than words and reading. I just have to use whatever method suits the lesson and learner. I just use the projector now, I used to have a smartboard which was really good, but I don't have that now. When I had a smartboard, my lessons were much more interactive then and more fun. I don't use powerpoint (Geoff).

5.3.2 Perceptions of technology usefulness.

It was suggested that technology contributed to student's experiences in a positive way because they were able to interact with teachers and peers via the VLE to discuss issues and access help and support at any time.

It does act as a motivation for students who know they will get a response if they have a problem away from the college (Peter).

Peter continued and identified some of the benefits that were representative of comments from the more enthusiastic teachers in the study.

Computers have a useful role in the teaching. I find the technology really good in terms of showing some really good images. Youtube clips and videos and re-caps, it definitely has a place, but could still be used better and more effectively. I think the effect of ICT has been positive; I have embraced it from the start, and my teaching is definitely better as a result (Peter).

The place and role of technology identified from the teacher's viewpoint was that technology was a useful addition, but it is not a cure for all of the ills that exist as stated by Earle (2002).

I.T. is not the panacea, it is a tool that we should be using to better our lives, make being a human being better, but at the moment it is working the other way round when students are not able to communicate properly (Ray).

The belief among teachers that technology is a useful addition or tool for existing teaching methods was widespread, and technology is confined, when used, to supplement traditional teaching methods related to the transfer of information from teachers to students (section 2.4.4).

> *It adds to parts of the lesson, and for that 10 minutes it enhanced [teaching], it has some value in certain circumstances it is a tool to go with all the other tools at your disposal. I use it every lesson, but only when I see it fit (James).*

The potential for online delivery of courses raised concerns with one teacher.

> *There are now complete apprenticeship courses that are totally online, I had to investigate online early years' programmes, and it horrifies me that early years' practitioners depend on themselves to train themselves, wouldn't you rather have someone with 40 years of experience training them and it is [just] because they promise quick results (Gill).*

5.3.3 Summary.

The analysis of the interview data regarding the role and teacher engagement with technology showed there was a degree of consistency in the responses of interviewees that technology integration into teacher practice primarily meant the use of programmes such as Microsoft Powerpoint within traditional presentation type, teacher-centred classes. Less than half of the teachers used technology in any other way than this.

The positive benefits of technology were related to student engagement and in being able to bridge the gap between theory and practice in some subject areas. Students of low ability were able to use images rather than just relying on text; this was considered to be an advantage and benefited student learning.

Teacher perceptions around the use of technology in their teaching practice showed some teachers to be very enthusiastic about the potential offered by integrating technology from a student engagement standpoint and the access to materials and peers through the VLE. Nevertheless, an equal number expressed an opinion that technology should not be viewed as having all of the answers to the perceived failings in education as a whole and should be used only when appropriate in classroom delivery.

5.4 Management.

5.4.1 Introduction

Post-Compulsory education falls under the umbrella of Office for Standards in Education (Ofsted), since it became the dominant partner in a merger with the Adult Learning Inspectorate (ALI) in 2002 (Burnell, 2017). Ofsted has the authority to influence college operations in many areas through direct and indirect pressure and influence. Not all these interventions are welcomed and are viewed by some as “unwarranted interference and external mandation by external bodies seeking to control and stipulate the provisions, processes and outcomes in unhelpful ways” (Billett, 2014, p.2) see section 2.2.4. Some interventions have had far-reaching implications for the sector at every level, "making an impact on careers, classroom practice and, for some, a decision on whether to remain in the sector" (Burnell, 2017, p.228).

The imposition of standards in areas such as CPD and classroom practices can create conflict when they challenge the core beliefs of the teachers, Ertmer (2005) identified this as a second-order barrier. Zhao et al. (2002) identified these barriers as residing within all three of the identified teacher, project and context domains.

5.4.2 Management decisions.

5.4.2.1 External influences affecting technology integration.

There was a considerable degree of consensus from the majority of interviewees about the role and influence exerted by external bodies regarding CPD and its provision. The teachers perceived that external bodies manipulated many of the decisions taken in the college through a regime of inspection and audit. The majority of teachers confirmed that Ofsted inspections were a source of stress with a constant regime of internal and external audits.

> *A few years ago, there was a big push to integrate ILT [Interactive Learning Technology], and it had to be identified on lesson plans where it would be used in each lesson. I don’t know if that was a fad or trend at the time, I think that has dropped off now, either because it is not fashionable anymore or maybe other things that have superseded that. Things like British Values, Equality and Diversity, Safeguarding and Student Welfare those sorts of things and maybe ILT has dropped down the list of importance. If we rated where IT was on the importance*

agenda, it has probably fallen down that list, or it has been superseded with inspections, and we are driven by Ofsted (Don).

The influence of Ofsted and the impact it has in the colleges was evident through the interview data, and although Philip's comments appeared light-hearted, there was a serious undertone that came through.

We do a lot of staff development, but we do a lot of staff development that's sort of imposed on us, the type of CPD that's very strong at the moment is safeguarding and student welfare. We're at the moment, completely at the mercy of a re-Ofsted [inspection] and the eighteen months since [the last] Ofsted have been in has been a slog. There's been a lot of CPD that we've gone to, and come away from thinking I don't get the meaning of that. We would all do things if we see the value of it, it's when it is forced on you, and then you don't see the end product. I don't know what boxes it might be ticking for the hierarchy for an Ofsted inspection. It's like we're Troy and outside there is Ofsted we're under a siege mentality yea there's a huge horse out there, and it's got Ofsted in it (Philip).

It is not only in CPD where the influence and pressures from Ofsted are felt, as Gleeson et al. (2015) state, teachers are also encouraged to adopt classroom practices, including using prescribed resources, that comply with the criteria determined to be ‘good' or ‘outstanding' on the Ofsted grading scale.

We've had a change of specification, for A level, it's all changed, and so we have to write new powerpoints that go with the text we bought, so we're writing power-points now, you try to write them in the Ofsted way so it will have challenge, different coloured questions, so it refers to the text, well that's a grade D question, and then you have a problem –solving question. (Ray).

The nature of the CPD provided tends to be driven by external requirements based primarily on Ofsted audits and inspections, and the prominence of the technology-based CPD has diminished and been overtaken by other areas that are deemed to be of more significance and importance in satisfying the criteria of external audits. External audits can directly affect the performance of the college, and the Ofsted reports and grade influence stakeholders, and student numbers and retention directly affect funding of the colleges. External bodies do not take all the decisions related to technology integration and use, and internal actors are also responsible for decisions that affect technology integration.

5.4.2.2 Internal influences affecting technology integration.

As stated previously, personal preferences play a leading role in whether technology is adopted and integrated into classroom practice. Personal preference can also play a role in the selection of technology and software used by teachers. Teachers across all the colleges perceived there to be no clear and consistent method of identifying the types of technology to be used nor the packages to be used in teaching and learning and often it was left to personal preference. Avoiding ambiguity is vital in any change management process Carr, Hard, & Trahant (1996) see section 2.4.4.1 teachers felt that a lack of clarity contributed to the lack of technology integration.

> *The college does have a policy about no phones in lessons, but it slips, and some lecturers actually use mobile phone technology as part of the lesson (James).*

The perspective alluded to by James was offered by a colleague in the same college.

> *I allow students to use mobile phones and no way will I ever stop students using mobile phones (Mike).*

The issue was not confined to just one college but did appear to be unenforceable without a clear policy and direction from management.

> *There is no college-wide policy it tends to be department by department regarding the use of mobile phones, the other issue is you sometimes getting other students dropping in who are not from that area, who think hang on wait a minute nothing has been said to me (Don).*

As teachers control the activities in their class, as Shin (2015) stated, the level of technology integration, monitoring of technology use is accomplished through internal and external audits.

> *It would be frowned upon not to use ICT on an internal or external inspection without good reason, but the rest of it you're left alone really, nobody [is] saying use it (James).*

Materials used with technology are not subjected to evaluation by peers or colleagues before the materials are bought and utilized, as is shown in the following quotes from teachers in one college, barriers are created for teachers unfamiliar with the materials.

> *Here if we take on a new member of staff they might come along and say well this is what I use to do in my old school, can we use that or somebody in the senior team will come along having read TES or been to a conference and impose things when they have not been properly evaluated. We stick to what we like; it comes down to your personal preferences. Because when you're a teacher, and you have spent a decade teaching with a certain package you use that, because I know what I'm doing you use the packages you're used to (Ray).*

Ray continued to offer an insight into an example of software imposed on teachers without the necessary evaluation and the problems it causes as a result.

> *New software was introduced in the college, and it was great for English and subjects where you gave wordy answers, but it had no facility for inputting basic Maths symbols so was useless for the Maths and Science courses. To be constantly updating software and constantly looking at change that's quite a dangerous and a hard thing to do [but] it's what senior management would like us to do. In the department, there is much more discussion (Ray).*

Mike, another teacher in the same college, highlighted other problems regarding technology introductions as being a barrier.

> *The only things that frustrate me sometimes we find that various systems get introduced around college not always communicated to that what is actually coming (Mike).*

Pressure from management to use technology in particular ways without discussion or communication caused barriers, as Philip identified, communication was not very effective in his college in a different location.

> *If they said this is a new site, this is what we are going to do with it, go away create your resources run it for x amount of time and then we'll evaluate it and see what's happening with it, people would understand that, but going bang bang bang this is what we want, this is what you will do, this is what's going to happen, this is going to be the outcome, and then the outcome doesn't work, that alienates some staff, when it is forced on you, and then you don't see the end product. We would all like to be confident that if we tried things and they went wrong, you weren't going to be pilloried for it (Philip).*

5.4.2.3 Management Decisions

There is a fundamental shift in management practices in colleges, this has resulted in the adoption of what has been termed "Taylorist" practices within Further Education to "cheapen labour" the result of which is fewer staff, working harder and longer and teaching more students (Feather, 2017; Mather et al., 2007).

The proliferation of performance criteria and target setting has led to teachers questioning what constitutes a 'good' teacher under the new performance management regimes driving the sector (Plowright & Barr, 2012; Shain & Gleeson, 1999). Ertmer (1999) identified these barriers as second-order barriers created by challenges to the core beliefs of teachers. Zhao et al. (2002) depicted these barriers as residing within the project and context domains, affected by differences with existing teaching and management styles and the culture that exists in the college.

> *For the last, since I've been here, 5 years you're just pushed into the ground constantly, we do cover, we do invigilation, we have to do advice and guidance of evenings, we have to do a lot of admin that just they wouldn't get away with in schools to save money (Ray).*

Performance-based management systems demand attention, and constant demands for information, target grades, progress grades and attendance information, are considered an everyday function of the role of teachers (Bailey & Colley, 2015). Teachers in another location identified the continual demand for information led to confusion and frustration.

> *At the moment I don't know with ICT where I'm supposed to be tracking my student's progress, I've got three different trackers from three different people, I don't have the time to do three different trackers (Philip).*

Lynn, a colleague, echoed similar sentiments.

> *We have lots of parallel systems. So again, sometimes there're that many different systems that don't talk to each other that it's like how many times do I have to upload the same document or how many documents do I have to upload which sort of say the same things but in different format. One is for the college, one for*

[Senior Manager] one is for the apprentices [Awarding body] and my line manager, and we're counting and making sure that we're doing what we need to do (Lynn)

The change in prominence regarding the type of CPD was noted and illustrated in each college with the support role for teachers in helping them to source materials, prepare resources and integrate technology being made redundant in all colleges in the study. The majority of teachers in the study voiced similar comments to Don.

We have lost our ILT champions; each department would have someone who would find the latest software and innovations and disseminate this information as Best Practice, that doesn't happen here. The person we had here now has become less prominent when they used to support specific classroom delivery techniques. I think people just assume we know about ILT (Don).

5.4.2.4 Summary.

Internal and external forces have a significant impact on the role and integration of technology into teacher practice. The majority of teachers confirmed that Ofsted inspections were a source of stress with a continual regime of internal and external audits. External bodies such as Ofsted can mandate the CPD provision in the college through external audits and as stated the perception is that CPD related to technology use and integration seems to have become less important in recent years. The use of prescribed resources also form part of the audit regime as Gleeson et al. (2015) state; teachers are also encouraged to adopt classroom practices, including using prescribed resources, that comply with the criteria determined to be 'good' or 'outstanding' on the Ofsted grading scale. External audits can directly affect the performance of the college, stakeholders are influenced by the Ofsted report and grade, and student numbers and retention directly affect funding of the colleges and are deemed of vital importance by college management.

Internal decisions regarding technology use and integration also can act as a barrier to teacher practice. Personal preference can also play a role in the selection of technology and software used by teachers; there is little or no evaluation by peers or colleagues of the materials used. The lack of a consistent approach to the procurement and use of technology and software packages for teaching creates barriers for teachers unfamiliar with the software package that often changes or is considered not fit for purpose.

The proliferation of performance criteria and target setting has led to teachers questioning what constitutes a 'good' teacher under the new performance management regimes driving the sector (Plowright & Barr, 2012; Shain & Gleeson, 1999). Performance-based management systems and constant demands for information, led to confusion and frustration, increased stress, greater resentment and feelings of being undervalued.

Chapter 6 - Discussion, Limitations and Recommendation for Future Discussion.

6.1 Introduction.

In this chapter, I discuss the main findings of the study that have been presented earlier in Chapter 4 and Chapter 5, the limitations that affected the study and the potential areas for future research. The discussion section of this chapter will address the research questions in turn and as such will discuss first the teacher's perceptions of their self-efficacy and that of their colleagues in the use and integration of technology in their teaching practices. After this section, the discussion will examine how teachers use technology in their teaching practices and then the barriers and enablers that exist to the use of technology. The final section will then discuss the beliefs and attitudes of teachers concerning the integration and contribution technology can make in their teaching. The limitation section of the chapter will discuss the constraints of the study and how I might have approached some aspects differently. Suggestions for future research areas will be reviewed with a focus on implications for policy and management practice. The chapter concludes with recommendations in areas of management policy within the colleges to better meet the needs of teachers and thereby achieve the ambitions of the policymakers and government while outlining the implications for teachers and practitioners.

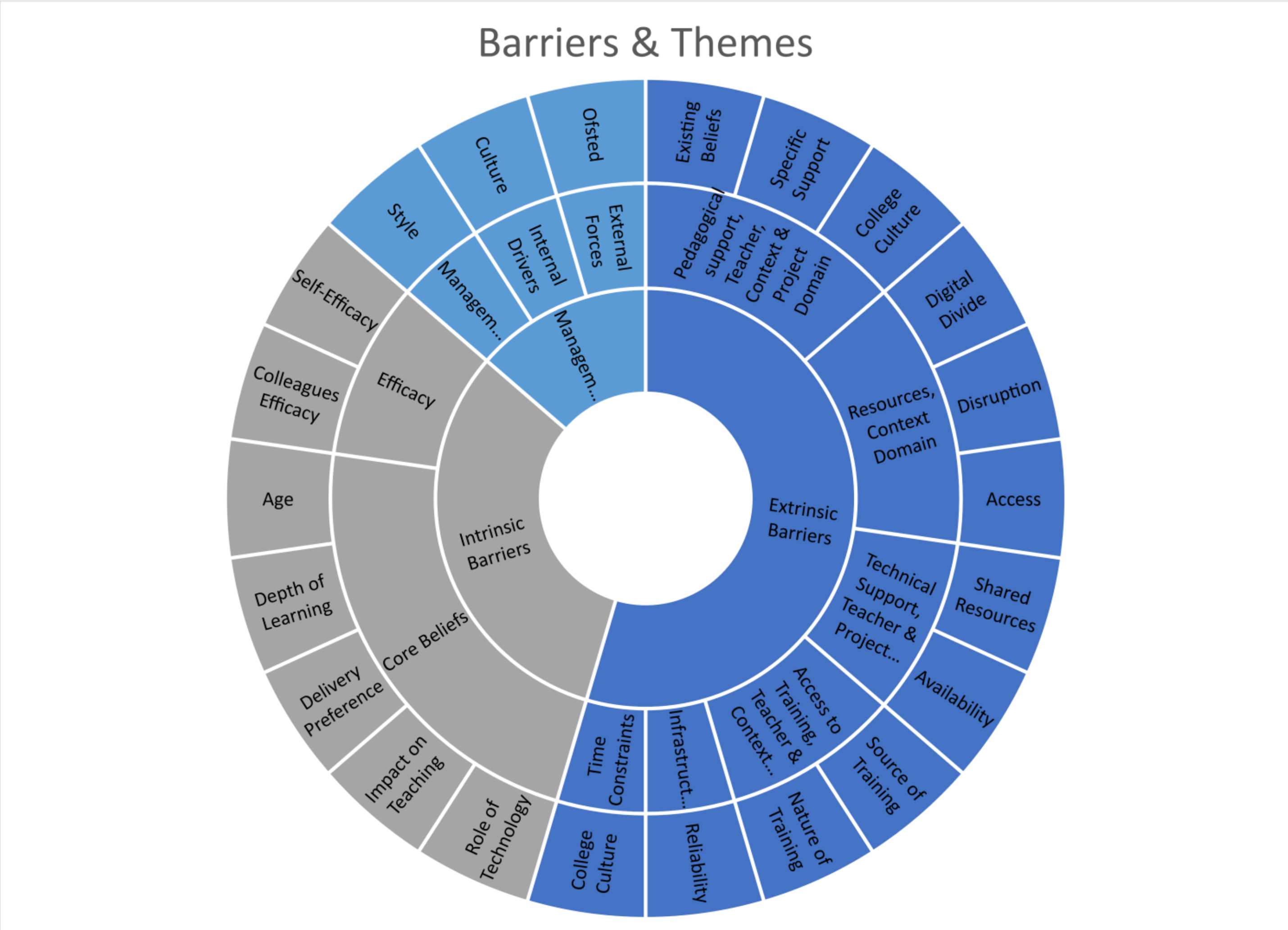

Figure 6. 1: Barriers and Themes from Interview Data

6.2 How do teachers in Further and Vocational Education use and integrate technology into their teaching practice?

The first research question generated data from participants in this study indicating that integration and engagement with technology varied and was consistent with the findings of Shin (2015) in the suggestion that teachers decide the level of integration, but as policy is determined mainly at government and college management level teachers' feel, they are obliged to engage. Nevertheless, the level of engagement varies, and many continue to use technology for convenience rather than any fundamental change to classroom practices. Subject content is often just formatted differently to incorporate technology, but fundamentally continuing with teaching styles that they are familiar and comfortable using and have remained mostly unchanged for 200 years (Akcaoglu et al*.,* 2015; Shin, 2015; Tyack & Cuban, 1997). The belief among many practitioners endures that "Good teaching remains good teaching with or without the technology" (Higgins et al*.,* 2007 p. 217) with evidence of "reshuffling the pack of cards, but little evidence of anybody trying a new game" Goodson & Mangan (1995 p. 626).

There were two aspects relating to teacher's use and integration of technology into their teaching practice, the first relates to how teachers utilise technology and the second concerns how often teachers use technology in their teaching practice. Based on the results of the 1st survey how teachers in Further and Vocational Education use and integrate technology into their teaching practice was initially shown to depend on the age of the teacher and the subject area that they taught.

The younger teachers under the age of 40 were much more likely to use technology to collect and prepare resources for use in teaching than teachers aged over 40. This reluctance to use technology could be because older teachers might have alternative sources and formats of materials that had been developed previously, if they have more years of teaching experience, but it was not possible to establish this from the data analysis completed in the current study.

In addressing the first research question, three key elements appear to be relevant. All teachers interviewed were positive in using technology for research and lesson preparation, while utilising the flexibility of the VLE's for the distribution of materials; these activities were perceived to be beneficial by the teachers. The technology adoption models, identified by MacCallum et al. (2014) see section 2.5, confirmed that for technology to be utilised there needed to be a perceived benefit for using it, these benefits were perceived by teachers in the study to be ease of use for research and preparation of teaching materials. Although the teachers used technology frequently to source, collect and prepare materials for use in the classroom, teachers still relied on more traditional teaching and presentation method with the use of power-point or similar tools.

The overwhelming perception among the teachers interviewed was that technology integration was predominately, though not exclusively, confined to the use of presentation tools and was viewed as a useful addition to their teaching techniques that could be utilised to enhance existing teaching approaches. There was little change in the practicalities of classroom delivery despite the investment in technology, high expectation and persuasive rhetoric from policymakers and advocates alike. Classroom delivery remained largely teacher-centred and focused on the transfer of information from teacher to student (Akcaoglu et al*.,* 2015; Shin, 2015). With classroom practices remaining mainly unchanged only the medium through which students acquire the necessary information has changed.

The training associated with technology integration for teachers has focused on the acquisition of technological skills, rather than the effective use of technology to enhance student learning and pedagogy. Therefore, the integration and adoption of technology has been limited. Without clear identifiable benefits to using technology, as stated by Mishra and Koehler (2006), teachers will continue to employ familiar, trusted existing techniques and technology integration will remain sporadic. Teachers in the study perceived technology as not offering sufficient benefit to teachers and students, and their view was that it was not a panacea for all of the perceived ills and failings in the further and vocational education sector.

6.3 What barriers and facilitators exist to inhibit or support the use of technology in Further/ Vocational Education?

The second research question explored the barriers and enablers that existed to the integration of technology in the Further and Vocational education sector within what has been termed broadly as extrinsic and intrinsic barriers. Throughout most of the 21st Century, there has been a significant and continued investment by many governments to support the provision and integration of technology into the educational sector (De Witte & Rogge, 2014; Nagel, 2014; Vaughan, 2013). There has not been the wholesale technological and pedagogical revolution in the education sector that was envisaged by many (Ertmer & Ottenbreit-Leftwich, 2010; Howard et al*.,* 2015; Plesch et al., 2013). Many barriers to technology integration are extrinsic and centred principally around quantifiable facets. Although there has been continued investment from governments, extrinsic barriers continue to exist and remain an ongoing source of frustration to teachers (Akcaoglu et al., 2015; Cárdenas-Claros & Oyanedel, 2015; Goktas et al., 2013).

Those barriers and enablers identified in this study echo those of previous research conducted in schools and universities. Resources are limited and not available to all teachers consistently, which acts as a barrier to integration. Barriers related to the potential for disruption in class through uncontrolled and uncoordinated use of technology were consistent with previous research (Heflin et al., 2017) and were brought about because of limited access to resources. Uncontrolled or uncoordinated access also creates barriers for teachers when trying to integrate technology into their teaching practice. The use of personal devices created barriers for teachers and were exaggerated when colleges implicitly rely on their use because of a lack of resources available to teachers and students (Goundar, 2014).

CPD mandated by Ofsted, and forming part of the inspection regime, has superseded training and CPD in how to integrate technology into teaching practice, besides CPD that forms part of an inspection regime is considered to be more important by college management. There are no consistent and uniform teaching packages used in colleges and teacher personal preference plays a major part; this acts as a barrier when teachers are untrained or unfamiliar with these packages. Workload and shortage of time are perceived to be barriers to integration because of the time needed to convert materials to a format used with technology (Samarawickrema & Stacey, 2007), time to train to use technology effectively, a known dip in performance and achievement as a result of technology integration that could reflect poorly on the teacher, as a result teachers continue to use what they are familiar with and know produces the results expected in student achievement (Somekh et.al., 2004).

Reliability of infrastructure is mostly beyond the control of colleges and is part of an ongoing and widespread debate at a government level. There were; however, some aspects of the extrinsic barriers highlighted that could be considered unique to the Further and Vocational Education sector. Lack of resources and access to the available resources created a barrier to technology integration, with the allocation of resources and access based on subject areas, Teachers that taught within the Academic subject area, subjects that had externally set curriculum and paper-based examinations did not receive the same access to resources as Vocational subject areas where courses were less prescribed, and resources and materials as well as submissions of course work and examinations were via the VLE. The nature of Vocational education exacerbated any lack of resources with popular high demand courses creating excess demand for resources, particularly during exam periods. Lack of resource within the college increased the reliance on students having personal resources to supplement this lack of provision. This trait created an additional barrier to technology integration due to a phenomena termed the digital divide. Unequal access to technology is perceived to be a barrier to technology use in low socio-economic areas (Hohlfeld et al., 2017; Zhang, 2014).

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More salient than the extrinsic barriers are the intrinsic barriers, identified as the ‘real gatekeepers’ to the integration of technology. Intrinsic barriers embrace the core beliefs and values that teachers hold; many of these are central to what the purpose of teaching is. These barriers are more difficult to address as they are individual, personal and liable to inexplicable change (Blackwell et al., 2013; Ertmer & Ottenbreit-Leftwich 2013; Howard, 2013). The integration of technology is far more complicated than just “some technical skills and a good attitude” (Zhao et al., 2002, p.511), the fundamental pedagogical beliefs of teachers will determine the style of teaching that they adopt in the delivery of classes (Bandura, 1986; Clark & Peterson, 1986).

Self-efficacy has been defined as “the belief that one has the necessary skills and abilities to perform the behaviour” (DiClemente et al., 2009, p.218). Self-efficacy theory proposed that certain behaviours will lead to specific outcomes and shows the individual’s expectation of personal success (Bandura, 1977, 1982; Maddux et al., 1982). Many factors determine a teacher’s self-efficacy in using and integrating technology and decisions taken by college management and external bodies have had an impact on teacher efficacy in the use of technology. The role of technology “champions” has been made redundant in all colleges’; this has removed a level of support that was viewed as essential by teachers to encourage technology integration. A shift in focus in recent years away from training and CPD related to technology integration to other areas, as determined primarily by Ofsted, has reduced the level of self-efficacy for teachers and limited the integration of technology confining it to areas that teachers feel comfortable in, linked to this notion of boundaries, that all teachers expressed, is the constant changes and upgrades and the perception from teachers is that they can never be confident when technology is continually changing; therefore, they will use technology in areas that they are comfortable and confident with

There are within colleges teachers that will not use and engage with technology in any form for either teaching or administrative purposes. The interview data showed that teachers used technology within boundaries that they established and set and were comfortable operating within. Policymakers and government actively promote the belief that teaching is undergoing an evolutionary change, shifting decidedly from a teacher-centred to a student-centred activity (Howard et al*.,* 2015; Plesch et al., 2013). In practice, established curricula and teaching approaches remain virtually unchanged with technology being underused and poorly integrated into the classroom (Akcaoglu et al*.,* 2015; Shin, 2015).

The methods employed by teachers will depend on their view of how learning is achieved (Conole et al., 2004; Trigwell & Prosser, 1996). Technology use raised concerns among a small number of teachers in two colleges regarding the depth of learning that took place and that technology promoted surface learning as defined by Marton & Säljö (1997). Instant access to answers through the internet, using search engines like 'Google' led to students having the apparent instant gratification of providing the answer. The concern from the teachers was that students might be surface rather than deep learning the subject. Some teachers believed that students are just happy to search for answers without really understanding either the question or the answer.

The interview data suggested that whether technology is integrated and used by teachers in their classroom practices depended on the fundamental beliefs' individuals hold over the effectiveness and benefits that were derived rived from its use. MacCallum et al. (2014) see section 2.4.5 the technology adoption model outlined relevant factors that determine if technology is adopted or rejected in practice. The beliefs that teachers hold regarding what constitutes teaching and how best this is achieved are the most crucial considerations. Personal preference has a considerable influence on classroom practice, the beliefs concerning what constitutes teaching and learning will have a dramatic impact on teaching style and willingness to change from a method that has probably developed over the years.

The integration of technology takes time to become effective; it requires significant changes to move from teacher-centred to learner-centred approaches and cannot be achieved in the short term (Chandra & Mills, 2015). Even when teachers are enthusiastic about using technology, there remain many barriers to successful integration into teaching practices.

6.4 What are teacher's beliefs concerning the integration and contribution technology can make to their teaching in Further/Vocational Education?

The third research question considered the beliefs of teachers concerning the integration and contribution technology can make to teaching and learning. Teacher's beliefs are not immediately identifiable, consistent or quantifiable and based on personal experience and emotions, beliefs often shape teacher perceptions of what constitutes teaching and are linked to their experiences as students and the context in which they operate. Beliefs become stronger over time and seem to exhibit no logical connections between differing beliefs (Hansen & Stephens, 2000; Joram & Gabriele, 1998; Lofstrom & Poom-Valickis, 2013; Pajaras, 1992). Teachers form their own beliefs about the role and contribution that technology can make to their teaching practice and the value that it can offer to students in terms of learning outcomes. The degree of change required by teachers to their central beliefs to integrate technology has often been underestimated (Blackwell et al., 2013) and challenges what many teachers regard as the basic tenets in teaching and learning (section 2.4.2).

The interview data implied that technology integration and use by teachers in their classroom practices depends on the fundamental beliefs' individuals hold over the effectiveness and benefits derived from its use. The findings in this study and reported by teachers endorsed those proposed by MacCallum et al. (2014) technology adoption model identified factors that determine if technology is adopted or rejected in practice. The beliefs that teachers hold regarding what constitutes teaching and how best this is achieved are the most crucial considerations.

Teachers in the study considered the purpose of education to be the transfer of information from the teacher to the student, and technology was viewed as an additional tool in what was primarily a teacher-centred process. Traditional teaching methods were considered to be the norm with teachers reluctant to move away from methods that had been developed over time. Technology was incorporated into existing methods of delivery, but there was no new pedagogy used by any of the teachers in the study. It was also stated that not all subjects were compatible with technology use, especially for subjects that were very hands-on or practical.

Teachers were positive about the use of technology and the benefits gained from its use; they perceived that it made a positive contribution to their teaching practice and student achievement through better engagement. Teachers enjoyed the flexibility and options that were available with using technology in classes and presented this as a positive contribution in moving towards a student-centred approach to teaching and learning while the access through VLE's when out of college meant that students could interact with the colleagues and teachers.

A further positive aspect of using technology, derived from the data of participants, was the ability to enhance and demonstrate aspects of the curriculum that was not possible previously, this advance was through the application of computer graphics that enabled students to view 3D diagrams, images, videos and graphics that enhanced the interactivity for students and promoted student engagement with the subject.

The teachers interviewed were positive and receptive to the potential and possibilities that technology could offer, but these positions were tempered by an almost innate caution that inhibited them from whole-heartedly accepting all the claims made in some quarters. While all the teachers agreed that technology-enhanced student engagement, they were unconvinced that it raised standards of attainment or the benefits and improvements when measured against the methods that they used currently.

6.5 Limitations of the study.

Whilst the study offers us some interesting insights into teacher's beliefs about the use of technology the research, like all research the study is subject to certain limitations The first limitation of the study is the number of participants, there were only nine colleges that participated and contributed data, the total number of colleges in England according to the Association of Colleges in their recent 2017/18 data is 181 FE colleges. A comparison of data, between the sample participating and the 2017 Education and Training Foundation FE Workforce data (2017), shows that the sample can be seen to be comparable with the sector, but the number of participating colleges is relatively small. The willingness of the colleges to participate in the survey was the first obstacle encountered it was difficult to persuade college principals to allow participation in the study. Any number of theories might be presented for non-participation, but some of the reasons given were that the college did not participate in outside research projects, the college and staff were busy preparing for inspections or audits, the college was approaching examinations and assessment period and staff would be unable to devote any time to the project, the college was undertaking other research in the area of the study and therefore it would just be a duplication of their research. Any or all of these were major obstacles, but there could be no participation without the consent of the college principal.

Another limitation of the study was down to the difference between the number of participants taking part in the first phase and second phase survey. Early in the study, and as a result of the concerns raised from the principals regarding participation and reasons for non-participation, there was a concern that there would not be sufficient participants completing the first survey. To minimise the survey completion time and thereby overcome any potential issue presented by this; the intention was to keep the survey as short as possible to complete. In hindsight, it would have been more advantageous to have incorporated the second phase survey with the first, but the colleges allocated a specific time frame before summer break that proved to be a major constraint. The advantage of merging both surveys would have been having a larger overall number of data sets to compare with other survey data to provide further support to claims of the sample being representative of the sector. While it is difficult to claim that the sample is representative of the entire sector, the sample in the study does reflect favourably with the much larger study conducted by Frontier Economics 2017. Nevertheless, it has to be accepted that the perceptions and views expressed are personal viewpoints and cannot, of course, be claimed as representative of the entire sector.

It had been my initial intention to compare colleges in different geographical areas within the study. Perhaps this is an area for future study provided a larger and more geographically diverse sample can be obtained, this will, of course, be a much larger study requiring more time and resources during the data collection and analysis phases, but it could provide useful data in research exploring the existence of the digital divide, the existence of which acted as a barrier for teachers in one college to technology integration.

When it came to the distribution of the second stage questionnaire, the number of participants dropped off compared with the first stage questionnaire. With the responses to the second phase survey being more narrative in nature, if a greater number of participants had completed the survey, it would have added to the study and may have provided more evidence to support the notion that the study reflected the wider sector.

6.6 The future: Implications for Policy, Practice & Research

I began the study when the integration of technology and ICT into teaching practices within Further and Vocational Education was at the forefront of policy from the perspective of the government, policymakers, external auditors and the management in FE colleges. The investment in technology, both hardware and software, has been considerable, and the expectation from government was always that technology would encourage more and better engagement with learning leading to better attainment. Mindful of the external pressure from businesses, it was also hoped that students would graduate competent in the uses of technology and familiar with the applications used in different sectors of business. Previously the CPD within colleges focused on technology, and there was an expectation that teachers would integrate technology into their teaching practices.

Research in other sectors provided little in the way of evidence to support the notion that technology was integrated in anything other than a rudimentary and superficial way. The perception from the teachers in the study regarding the place of technology is that the use of technology appears to have fallen down the list of priorities and been superseded by other “more important” issues that have taken precedence regarding the limited time allocated for CPD, with management attention focused on the requirements of external audits and inspections where current CPD requirements have superseded the use and integration of technology.

The implications of the research study vary depending upon the level at which it is viewed. The study provides an insight into what skills are perceived to be lacking by teachers in the Post-Compulsory teaching sector. This insight focuses not on the necessary skills that are used for everyday purposes such as word processing, research and presentations that all participants profess to possess at a good level of competence, but the skills that are required for the specific function of being able to integrate and use technology competently in teaching and delivery.

The study may provide an impetus for the inclusion of courses relating to the integration of technology in teacher training courses. The provision of this in-depth training, using universal and widespread technology, would enable trainee teachers or in-service teachers working towards a teaching qualification an opportunity to develop skills and materials in a supportive and collaborative environment and would go some way towards enhancing the integration of technology into the classroom. The provision of such training removed from the colleges will enable teachers to become familiar with creating materials for use in their teaching practices as well as becoming familiar with the pedagogical methods required for teaching with technology rather than teaching about technology. This type of training would not address the needs of teachers who were engaged before 2007 when there was no requirement for teachers to possess a teaching qualification. Training of staff in this category would need to be addressed locally within the colleges.

At an institutional level, the study presented the perceptions of teachers, qualified or working towards a qualification and with many years of experience teaching in the sector, regarding the skills and training that are needed to enable them to integrate technology effectively into their teaching practice. The teachers identified that there was a need for concentrated and targeted training in the development of teaching approaches and methods integrating technology into classroom practice. It was suggested that training of this nature should be provided not as CPD sessions limited to perhaps one hour every month, but as a course delivered over days and weeks at a time when the college was normally closed during the summer break when students were not in attendance.

Within the participating colleges, the study provides feedback to management on the perceptions of teachers identifying the barriers and beliefs of practitioners who are expected to integrate and use technology. The study highlighted the perception among participants that there was a lack of direction to the use and purpose of technology, personal preference in the use and selection of teaching packages resulted in many different software packages being used across and within courses. Teachers perceive there to be a lack of consistency and leadership from management and rather than being trained on the best package available to meet the requirements of the curriculum, personal preference dominates.

There is an opportunity for the colleges to decide individually within each department and in conjunction with management what technology should be used for each course to meet the learning objectives of the course most effectively, this would provide a degree of consistency and direction for teaching staff. There should be a skills audit of staff delivering the courses and individual training plans developed. In this way, staff can achieve clearly defined levels of competency that can identify the parts of a course they could teach using the technology available. This would go some way to setting in place a consistent policy regarding the use of technology, eliminating personal preference and pet projects that could in themselves act as barriers to teachers.

The study provides management, in the participating colleges, with a snapshot of the perceptions and beliefs of teachers regarding the use and integration of technology into teaching practice. It has identified barriers and facilitators that exist and the beliefs and attitudes that teachers have to the integration of technology. The study provides an insight into the types of training that teachers feel they require and the perceptions that they have regarding the position of technology in teacher's practices.

Management must clearly define the benefits of technology integration, communicate the benefits and rationale for using technology and drive the change if there is a serious intention of integrating technology. Further change could affect the sector; there is the potential for the student demographics of FE and Vocational Education to change as a result of the new Apprenticeship Scheme. Employers faced with a government levy to support the Apprenticeship scheme have started enrolling existing employees on training courses to gain some benefit from the levy imposed on them by government. This means that older skilled workers, that have gained years of experience doing an actual job and learning a trade in the industry are now attending colleges at the behest of their employers to study formal courses and gain qualifications, often for the first time and at an age when they would never have expected to be in a classroom. This is potentially another barrier to the integration of technology into the classroom and teaching practices. The possibility exists where many students have never used technology in anything other than a very basic way. They may find the experience of returning to the classroom daunting enough without the added stress caused by having to cope with the technology as used in many Vocational courses, as repositories for materials and, for submitting and completing assignments. There is the potential for the demographics in some subjects and course to be changed by an influx of older students.

6.7 Future Research.

"The greatest problem we face with educational technology has little to do with recognizing that it must be an essential part of teaching and learning. Rather it is a lack of clear vision as to its real purpose and usefulness in shaping the educational system of the future." (Roblyer, 1993, p.13).

A priority future research area would be to define what technology integration meant. This would cover several areas, determining what type of technology is effective and the context in which it is useful. From the results of the study, the teachers primarily perceive technology integration to mean using presentation tools with the aid of computers and projectors. If this is what is perceived and accepted as technology integration, then little has changed when delivery remains a teacher-centred activity continuing to focus on the transfer of information from teacher to student. If this is technology integration what is the benefit for teachers in changing what they already do and have resources for doing, as Rogers, (2003) and MacCallum et al. (2014) state there has to be an improvement or benefit for the teachers to make the change and implement the integration of technology.

There are many research areas that could be explored in any future research as a result of the study presented. An equally important sphere is a theme that researchers have continued to grapple with, that is to determine whether technology integration into teaching and learning improves student attainment as many of the advocates of technology have stated. In a related field, research could identify if greater student engagement leads to improved attainment and results.

Once this has been determined that better engagement leads to better attainment then it will be possible to confidently engage with teachers supported by data showing that technology integration is effective, this would address a major barrier that came out of the study whereby teachers were not convinced of the improvements that could be achieved through the integration and use of technology, the teachers accepted that improvements in student engagement was noticeable, but did this engagement lead to improved attainment. As a result of this and within the context in which further and vocational education is situated teachers continued to use methods of delivery that they are familiar with and perceived to be the best way for students to achieve the learning outcomes of the course.

It would help in the process of integration if there were a clear definition of what technology integration in the classroom means. Once this has been determined, then research could take place to determine if using technology in this way improves student achievement. If and when it has been established that technology integration improves student attainment then there will have to be an intensive programme of workshops and training to convince teachers of the results first of all and then a programme of training and staff development in-line with the results, packages and technology available.

In this context it must be understood why the technology is not being used, and to this end there is a need for a study to discover why this is the case to discover the barriers that exist to technology integration and then work towards reducing and eliminating them. The next stage for any future research project specific to this question would be to focus on one college and engage all staff to ensure that the entire spectrum of teachers is covered from the most enthusiastic advocates to the most reluctant technophobes. This way, the data would reflect the whole of the college rather than any one particular sector.

The over-riding factor within any study of this nature is that participants need to convinced that it will be carried out in an atmosphere of discovery, support and development of staff, rather than one that is perceived with suspicion and unclear or ulterior management motives in which case, it might be perceived as a method to reduce staff numbers or cull staff members that do not meet some predetermined criteria or level of competence.

Another potential area of research would be to determine the level of access to technology within colleges and how the access to this technology is determined. As I have previously stated, I began this study while working in a Gulf State, and every classroom was equipped with an interactive whiteboard and associated technology. My perception prior to the data collection part of this study was that there would be a similar inventory available in colleges in England, this is clearly not the case, therefore it would be worthwhile investigating how much technology is available in collages, how the allocation and access to this technology is decided and whether colleges are reliant on students having their own personal devices to supplement any lack of resources in colleges.

The barriers and affordances to the use of technology are multiple and complex and were centred around three themes within this study, extrinsic barriers related to deficiencies and shortages have been highlighted as directly affecting the integration of technology by teachers interviewed. Incorporated within extrinsic barriers were three clearly identified conditions related to the provision of resources and how access to resources were often determined by the context of Further and Vocational Education. The second main theme concerned intrinsic barriers incorporating efficacy, brought about by a lack of specific training, and the core beliefs of teachers, that contributed many facets defined as barriers, that were shown to be personal and individual in nature and had a greater impact on technology integration. The final main theme included management attitudes and the influence of external bodies; there needs to be a clear vision of the contribution that technology can make to teaching and learning and a set clearly defined policies, procedures and standards for integration of technology within colleges to provide a level of consistency that is evidently lacking at the present time in the participating colleges.

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Appendices:

Appendix A.
Ethical Approval from University.

Durham University
School of Education

Shaped by the past, creating the future

28th April 2017

Robert Shedden
r.j.shedden@durham.ac.uk

Dear Robert

Digital Literacy and use of ICT in Vocational Education colleges

I am pleased to inform you that your ethics application for the above research project has been approved by the School of Education Ethics Committee.

May we take this opportunity to wish you good luck with your research.

Yours sincerely,

Nadin Beckmann

Dr Nadin Beckmann
School of Education Ethics Committee Chair

Leazes Road
Durham, DH1 1TA
Telephone +44 (0)191 334 2000 Fax +44 (0)191 334 8311
www.durham.ac.uk/education

Appendix B.

Satisfying criteria from Shenton (2004):

Quality Criterion	Provision made by Researcher	Achieved in Study
Credibility	Adoption of appropriate, well recognised research methods	Research methods identified
	Development of early familiarity with culture of participating organisations	Communication with college principals and meetings with designated coordinators (Appendix
	Random sampling of individuals serving as informants	Participants selected from volunteers
	Triangulation via use of different methods, different types of informants and different sites	Survey and interviews from across three college sites
	Tactics to help ensure honesty in participants	
	Use of "reflective commentary"	Chapter 3 section 3.2.2.3, 3.2.2.4, 3.2.2.5 & 3.2.2.6
	Description of background, qualifications and experience of the researcher	Introduction of self in initial contact with principle and potted life history before each one-to-one interview
	Member checks of data collected/interpretations formed	Dialogue with participants and review of transcripts to verify
	Thick description of phenomenon under scrutiny	Setting out context of study in as much detail as possible to describe study but maintain anonymity and satisfy university ethics approval.
	Examination of previous research to frame findings	Etrmer First/second order barriers Zhao et al
Transferability	Provision of background data to establish context of study and detailed description of phenomenon in question to allow comparisons to be made	Identified and communicated in thesis
Dependability	Employment of "overlapping methods"	Surveys and interviews Appendix 3, 4 & 5.
	In-depth methodological description to allow study to be repeated	Chapter 3 in thesis section 3.5
Confirmability	Triangulation to reduce effect of investigator bias	
	Admission of researcher's beliefs and assumptions	Chapter 3 section 3.2.2.4
	Recognition of shortcomings in study's methods and their potential effects	Chapter 6
	In-depth methodological description to allow integrity of research results to be scrutinised	Chapter 3 section 3.5
	Use of diagrams to demonstrate "audit trail" research	

Appendix C.
Participation request letter

School of Education

Dear Principal ______________,

My name is Robert Shedden and I am a Doctoral student with Durham University (working with Dr. Julie Rattray and Dr. Andrew Joyce-Gibbons). I am writing to ask for your help and permission to approach some of the teachers who are studying on courses in your institute, who may be practitioners in other institutes, and also members of staff within your institute who would be willing to help with my research.

My research project primarily focuses on an exploration of the underlying beliefs held by teachers in Vocational and Further Education regarding the integration of ICT into their teaching. My own professional background is that after a career and over 20 years of management experience in business I returned to university to study at age 43 and then studied a PGCE in post compulsory education. I have worked in the U.K. in an F.E. college and university in South Wales, where I was living at the time, as an hourly paid lecturer. I moved to the Midlands to take up a full time position with Kaplan Professional before working for more than 8 years overseas in Libya and Abu Dhabi. I progressed from Lecturer to Deputy Principle during my time overseas and began my Doctorate with Durham 4 years ago. The motivation for my research centers around the wide spread investment by governments in the acquisition of ICT in the expectation that this alone will improve student attainment and educational levels. I am approaching the study from the perspective of the teachers in Vocational/FE colleges I am particularly interested in how teachers feel about using technology and the training and support that they receive to use technologies in the way that many policy makers envisage. More specifically I am focusing on the extent to which the introduction of ICT brought about any perceptible change in the pedagogy in Vocational/FE teaching or are teachers using technology for mainly preparation and administration tasks.

I have chosen the Vocational/ FE sector for my research because I am part of it and feel passionately about the work that is done in this important part of education and as the Skills Commission identified the Vocational Education sector is under-represented in Educational research. Initially the study will require the distribution and completion of an on-line questionnaire to establish the profiles of teachers currently working in Vocational/FE delivery. After this stage a representative sample of participants will be approached to participate in one to one interviews and/or a focus group. The interview will utilise photo-elicitation instead of the normal question format. Participants will be asked to collect photographs or images that reflect their beliefs about the use of ICT in their teaching. They will then explain what the image means and represents for them. Discussion will therefore be heavily focused on the representations of the images that the participants identify. Confidentiality for participants will be maintained and as with any research will be sanctioned by Durham University ethics committee. Participants will have the right to withdraw from the project at any time and all data provided will be returned and not used in the final study.

I hope that you will allow me to engage with the staff and relevant students within your institute as I feel this an opportunity to perhaps, in some small way, benefit the delivery of courses in Vocational Education and give the teachers an opportunity to discuss the issues that may affect how they deliver and engage in the classroom.

I would be happy to discuss the project with you more fully before you agree that I can contact your staff and of course you are free to contact my supervisors should you have any other questions about my credentials.

Robert J. Shedden
Email: r.j.shedden@durham.co.uk
Mobile: 07786-958179
Enclosed:
Link to survey: https://durham.onlinesurveys.ac.uk/introduction-phase-version-3

Supervisor contact details:
Dr. Julie Rattray. Email: Julie.rattray@durham.ac.uk
Dr. Andrew Joyce-Gibbons Email: Andrew.joyce-gibbons@durham.ac.uk

Appendix D.
Phase 1 Survey.

Phase 1 Survey Version 5

0%

0% complete

You are invited to take part in a research to examine the beliefs and perceptions of teachers in Vocational Education in the integration and use of Information Communication Technology (ICT) in their teaching practice.

Please read this notice fully and email me or my supervisors (contact details below) if you have any questions before clicking "Next". By clicking "Next" you are agreeing to be part of the study and giving permission for the information you provide to be used in the ways described below.

The study is part of Robert Shedden's Doctorate in Education with the University of Durham.

* This research project is supervised by Dr Julie Rattray & Dr. Andrew Joyce-Gibbons (julie.rattray@durham.ac.uk & andrew.joyce-gibbons@durham.ac.uk from the School of Education at Durham University.

The purpose of this study is to explore your beliefs about the use of ICT in **your** teaching. I am interested not simply in your beliefs but also in your professional backgrounds and experiences and how this might shape your views about the use of technology in your teaching and learning.
Throughout this study I focus on the use of Information Communication Technology (ICT) defining ICT as technologies capable of communication with other remote devices enabling research, communication and resource sharing between teachers and learners. This includes the Internet, wireless networks, cell phones, and other communication mediums. Additionally other classroom furniture such as smart boards or interactive white boards are also included.

Answering this questionnaire should require no more than 30 minutes.
All responses will be treated in strict confidence and only the researcher and their direct supervisors will have access to any details that could be used to identify the participants.

If you are willing to participate in further stages of the research project ,which would involve a one-to-one discussion and/or focus group, then please fill in the personal details at the beginning of the survey however, if you do not wish to participate any further then these details are not required.

If you provide details I may contact you in the future after the questionnaire data has been analysed with a view to conducting one-to-one discussions.

By completing the questionnaire and pressing the "Finish button" you are agreeing to the information you supply being used in the research project.

You are free to decide whether or not to participate. If you decide to participate, you are free to withdraw at any time without any negative consequences for you.

You will only be asked to provide your name and a contact email address if you are willing to participate in phase two of the study - a short interview.

Thank you very much for your collaboration. Your input is really valuable and important for my study.

Confidential participant information

Location *Required*

Name: Contact Details: Phone or email *Optional*

Age: *Required*

- 29 and under
- from 30 to 39
- from 40 to 49
- 50 or more

Gender: *Optional*

- Female
- Male

Subject Area(s): *Required*

Teaching hours per week *Optional*

- fewer than 10 hours
- 10-15 hours
- 16-20 hours
- 21-25 hours
- more than 25 hours

Including this year, how long have you been teaching in Vocational or Further Education? *Required*

- Less than 12 months
- 1-3 years
- 4-10 years
- 11-20 years
- 21-30 years
- More than 30 years

Experience of using ICT within your teaching practice

Do you use computers and/or the internet for the following activities? *Required*

For how many years have you been using ICT in your teaching? *Optional*

- Less than 12 months
- Between 1 to 3 y ears
- Between 4 to 6 y ears
- More than 6 years

How often do you use ICT in your classes? *Optional*

- Never
- Rarely
- Sometimes
- Often
- All the time

ICT access for teaching

This part of the survey uses a table of questions, view as separate questions instead?

When you use ICT during class teaching in front of the students, which equipment is available? *Required*

Please don't select more than 1 answer(s) per row.

Please select at least 1 answer(s).

	never	rarely	sometimes	often	all the time
Students are able to access computers, tablets or digital devices and/or Internet for study					
Neither teachers nor students					

use computers, tablets or digital devices and/or the internet during classes.					
Only the teacher uses a computers, tablets or digital devices and/or Internet					
Both, teacher and students, use computers, tablets or digital devices and/or Internet					

Which ICT equipment do you have access to in your classes? *Required*

Desktop computer without internet access

Desktop computer with internet access

Non-internet-connected laptop, tablet PC, net book or notebook computer

Internet-connected laptop, tablet PC, net book or notebook computer

Interactive whiteboard

Computer laboratory

Does your college provide teachers with laptops (or tablet, PC desktop computers) for their own use? (Please specify) *Optional*

If you selected Yes please specify: *Optional*

Are the students allowed to use the personally owned devices listed below at college for learning? *Optional*

Laptop, tablet,

Smartphone

Support to teachers for ICT use

This part of the survey uses a table of questions, view as separate questions instead?

Have you ever undertaken professional development in the following areas? *Required*

Please don't select more than 1 answer(s) per row.

Please select at least 1 answer(s).

	Yes	No
Introductory courses on internet use and general applications (basic word-processing, spreadsheets, presentations, databases, etc.		
Advanced courses on applications (advanced word-processing, complex relational databases, Virtual Learning Environment, etc.)		
Advanced courses on internet use (creating websites/ home page, video conferencing, etc.)		
Equipment-specific training (interactive whiteboard, laptop, tablet, etc.)		
Courses on the pedagogical use of ICT in teaching and learning		
Subject-specific training on learning applications (tutorials, simulations, etc.)		
Course on multimedia (using digital video, audio equipment, etc.)		
Participate in online communities (e.g., mailing lists, groups, blogs) for professional discussions with other teachers		
ICT training provided by college staff Personal learning about ICT in your own time		
Other professional development opportunities related to ICT		

Who provides the ICT support at your college? *Required*

- A more experienced / knowledgeable teacher
- College ICT/technician(s) or professional
- Teaching or Administrative colleagues
- Experts from outside the college
- An online help desk, community or website

ICT based activities and material used for teaching

This part of the survey uses a table of questions, view as separate questions instead?

How often do you do the following activities?

Please don't select more than 1 answer(s) per row.

Please select at least 1 answer(s).

	Never	Rarely	Sometimes	Often	All the time
Browse/search the internet to collect information to prepare lessons					
Browse/search the internet to collect resources to be used during lessons					
Use applications to prepare presentations for lessons					
Create your own digital learning materials for students					
Prepare exercises and tasks for students					

This part of the survey uses a table of questions, view as separate questions instead?

How often do you do the following activities?

Please don't select more than 1 answer(s) per row.

Please select at least 1 answer(s).

Use ICT to provide feedback and/or assess students' learning					
Evaluate digital learning resources in the subject(s) you teach					
Download/upload/ browse material from the college's website					
Download/upload/ browse material from a learning platform					
Look for online professional development opportunities					

This part of the survey uses a table of questions, view as separate questions instead?

Which of the following types of materials have you used when teaching your classes with the aid of a computer and/or the Internet? *Required*

Please don't select more than 1 answer(s) per row.

Please select at least 1 answer(s).

	Yes	No
Material that you've searched the Internet for		
Existing online material from established educational sources		
Material that is available on the college's computer network or database		
Electronic offline material (e.g., C D-ROM)		

Material of your own creation		
Material from mainstream websites, (news sites, streaming sites or social media).		

Obstacles to the use of ICT in teaching and learning

This part of the survey uses a table of questions, view as separate questions instead?

Is the use of ICT in teaching and learning adversely affected by the following? *Required*

Please don't select more than 1 answer(s) per row.

Please select at least 1 answer(s).

	Not at all	A little	Partially	A lot
Insufficient number of computers				
Insufficient number of internet-connected computers				
Insufficient Internet bandwidth or speed				
Insufficient number of interactive whiteboards				
Insufficient number of laptops/ notebooks				
College computers out of date and/or needing repair				
Lack of adequate skills of teachers				

Insufficient technical support for teachers				
Insufficient pedagogical support for teachers				

This part of the survey uses a table of questions, view as separate questions instead?

Is the use of ICT in teaching and learning adversely affected by the following?

Please don't select more than 1 answer(s) per row.

Please select at least 1 answer(s).

Lack of adequate content/ material for teaching				
Too difficult to integrate ICT use into the curriculum				
Lack of pedagogical models on how to use ICT for learning				
Classroom layout, size and furniture etc,				
Pressure to prepare students for exams				
Most teachers not in favour of the use of				

ICT at college				
Lack of interest of teachers				
No or unclear benefit to use ICT for teaching				
Using ICT in teaching and learning not being a goal in our college				

Teachers' skills

This part of the survey uses a table of questions, view as separate questions instead?

To what extent are you confident in the following? *Required*

Please don't select more than 1 answer(s) per row.

Please select at least 1 answer(s).

	None	A little	Somewhat	A lot
Produce a text using a word processing programme				
Use emails to communicate with others				
Capture and edit digital photos, movies or other images				
Edit text online containing internet links and images				

Create a database				
Create and/or edit a questionnaire online				
Email a file to someone				
Organise computer files in folders and sub-folders				
Use a spreadsheet (e.g., Excel)				
Use a spreadsheet to plot a graph				

This part of the survey uses a table of questions, view as separate questions instead?

To what extent are you confident in the following?

Please don't select more than 1 answer(s) per row.

Please select at least 1 answer(s).

Create a presentation with simple animation functions				
Create a presentation with video or audio clips				
Participate in a discussion forum on the internet				
Create and maintain blogs or web sites				
Participate in social networks				

Download and install software on a computer				
Download or upload curriculum resources from/to websites or learning platforms for students to use				
Prepare materials to use with an interactive whiteboard				
Programming				

- Next

ICT in school management

- This part of the survey uses a table of questions, view as separate questions instead?
- Who is given your professional email address? *Optional*
- Please don't select more than 1 answer(s) per row.
- Please select at least 1 answer(s).

	Yes	No
To teachers?		
To students?		
To administrative & support staff?		

- An Electronic Register System is a system whereby you can record attendance in your class and in your college, do you use one in your college? *Optional*
- Yes
- No
- Don't Know
- A Learning Management System (LMS) is a system whereby you can communicate directly with your students and post marks/grades, attendace and feedback to students do you use such a system in the college? (This could be with a Virtual Learning Environment (VLE))
- Yes
- No
- Don't Know

- A Content Management System (CMS) allows modification and editing of material that is used collaboratively in colleges, is such a system used in your institution? (This could be with a Virtual Learning Environment (VLE)) *Optional*
- Yes
- No
- Don't Know
- You have now completed the survey and thank you very much for taking the time to do so.
- By completing the questionnaire and pressing the "Finish button" you are agreeing to the information you supply being used in the research project.
- You are free to decide whether or not to participate. If you decide to participate, you are free to withdraw at any time without any negative consequences for you.
- If you wish to withdraw from the survey please contact me or my supervisors so that the relevant data can be deleted.
- Robert Shedden (r.j.shedden@durham.ac.uk)
-
- Dr Julie Rattray & Dr. Andrew Joyce-Gibbons (julie.rattray@durham.ac.uk & andrew.joyce-gibbons@durham.ac.uk from the School of Education at Durham University.

Finish & Thank You

Appendix E.
Complete results chapter.

Statistically Significant results from One-Way between subject ANOVA.

Results of the one-way between subjects' ANOVA showing statistical significance on "Teacher perceived self-efficacy and integration of technology for tasks linked to preparation, teaching and delivery"

The one-way between subjects' ANOVA test results, shown in table 1, indicate that there is a statistically significant difference in the perceived self-efficacy of respondents in their ability to create an online questionnaire based on age.

Condition	Results
Age (n-225)	[$F(3,222)=8.038$, $p=.001$]
Subject Area (n=225)	[$F(3,222)=4.576$, $p=.004$]
Teaching Experience (n=224)	[$F(3,221)=1.832$, $p=.142$]

Appendix E Table 1: Participant self-efficacy in their ability to create an online questionnaire. ANOVA results by Age, Subject Area and Teaching Experience.

Table 2 shows that respondents in age groups 39 years and younger were more confident in being able to create an on-line questionnaire than were the participants aged 40 years and over.

Age Years	None	A little	Somewhat	A lot	Total Number
=<29		1	8	19	28
30 – 39	2	11	16	29	58
40 – 49	5	23	16	26	70
=>50	13	15	22	20	70

Appendix E Table 2: Reported self-efficacy of respondents in their ability to create an online questionnaire by age.

The one-way between subjects' ANOVA test results, shown in table 3, indicate that there is a statistically significant difference in the perceived self-efficacy of respondents in their ability to create a presentation containing simple animation based on age.

Condition	Results
Age (n-227)	[F(3,224)=3.329, p=.020]
Subject Area (n=227)	[F(3,224)=1.643, p=.180]
Teaching Experience (n=226)	[F(3,223)=1.837, p=.141]

Appendix E Table 3: Participant self-efficacy in their ability to create a presentation containing simple animation. ANOVA results by Age, Subject Area and Teaching Experience.

The results, shown in table 4, indicate that participants in the youngest age group had the most confidence in creating a presentation with simple animation although within all age groups most participants responded that they were somewhat confident in performing this task. There were a small number of participants across three age groups that reported no confidence in being able to create a presentation using simple animation.

Age Years	None	A little	Somewhat	A lot	Total Number
=<29		1	2	25	28
30 – 39	2		8	49	59
40 – 49	3	4	15	48	70
=>50	2	5	18	46	71

Appendix E Table 4: Reported self-efficacy of respondents in their ability to create a presentation containing simple animation by age.

The one-way between subjects' ANOVA test results, shown in table 5, indicate that there is a statistically significant difference in the perceived self-efficacy of respondents in their ability to create a presentation containing video based on age.

Condition	Results
Age (n-226)	[F(3,223)=5.541, p=.001]
Subject Area (n=226)	[F(3,223)=2.429, p=.066]
Teaching Experience (n=225)	[F(3,222)=.691, p=.558]

Appendix E Table 5: Participant self-efficacy in their ability to create a presentation containing video. ANOVA results by Age, Subject Area and Teaching Experience.

The results shown, in table 6, indicate that respondents in the youngest age group reported high levels of participants who were somewhat or more confident in creating a presentation containing video although, there was a slight increase in participants completing this task reporting little or no confidence.

Age Years	None	A little	Somewhat	A lot	Total Number
=<29		2	1	25	28
30 – 39		3	9	46	58
40 – 49	4	5	13	48	70
=>50	4	9	19	39	71

Appendix E Table 6: Reported self-efficacy of respondents in their ability to create a presentation containing video by age.

The one-way between subjects' ANOVA test results, shown in table 7, indicate that there is a statistically significant difference in the perceived self-efficacy of respondents in their ability to download materials from websites or learning platforms based on age.

Condition	Results
Age (n-226)	[F(3,223)=4.703, p=.003]
Subject Area (n=226)	[F(3,223)=1.141, p=.333]
Teaching Experience (n=225)	[F(3,222)=.590, p=.622]

Appendix E Table 7: Participant self-efficacy in their ability to download materials from websites or learning platforms. ANOVA results by Age, Subject Area and Teaching Experience.

Table 8 indicates that participants in the younger age group had more self-efficacy in downloading resources from websites and learning platforms than other age groups that had some respondents that had no confidence in doing this task.

Age Years	None	A little	Somewhat	A lot	Total Number
=<29			2	26	28
30 – 39	1	3	13	41	58
40 – 49	3	9	15	43	70
=>50	5	10	15	41	71

Appendix E Table 8: Reported self-efficacy of respondents in their ability to download resources from websites and learning platforms by age.

The one-way between subjects' ANOVA test results, shown in table 9, indicate that there is a statistically significant difference in the perceived self-efficacy of respondents in their ability to prepare materials for use with interactive whiteboards based on age and years of teaching experience.

Condition	Results
Age (n-226)	[$F(3,223)=2.982$, $p=.032$]
Subject Area (n=226)	[$F(3,223)=2.196$, $p=.089$]
Teaching Experience (n=225)	[$F(3,222)=3.299$, $p=.021$]

Appendix E Table 9: Participant self-efficacy in their ability to prepare materials for interactive whiteboards. ANOVA results by Age, Subject Area and Teaching Experience.

Table 10 indicates that the over 30 years age group had less perceived self-efficacy in this task.

Age Years	None	A little	Somewhat	A lot	Total Number
=<29	3	2	4	19	28
30 – 39	5	11	9	33	58
40 – 49	9	10	22	29	70
=>50	3	14	22	32	71

Appendix E Table 10: Reported self-efficacy of respondents in their ability to prepare materials for interactive whiteboards by age.

Table 11 shows participants with more than 4 years, but less than 21 years teaching experience had more self-efficacy in preparing materials for use with interactive whiteboards than did other participants.

Teaching Experience (Years)	None	A little	Somewhat	A lot	Total Number
=<1	1	2	6	10	19
1 - 3	1	5	7	20	33
4 – 10	10	15	17	44	86
11 – 20	7	10	21	32	70
=>21		4	12	11	27

Appendix E Table 11: Reported self-efficacy of respondents in their ability to prepare materials for interactive whiteboards by teaching experience.

The one-way between subjects' ANOVA results shown in Table 12 indicate age produced statistically significant results regarding teachers "use technology to collect resources to be used during lessons".

Condition	Results
Age (n-2225)	[F(3,225)=3.654, p=.013]
Subject Area (n=225)	[F(3,225)=1.126, p=.339]
Teaching Experience (n=227)	[F(3,224)=1.188, p=.315]

Appendix E Table 12: Participants' attitudes to engagement with and use of technology to collect resources to be used during lessons. ANOVA results by Age, Subject Area and Teaching Experience.

The one-way between subjects' ANOVA results shown in table 13 indicate that younger participants "use technology to collect resources to be used during lesson" often or all the time while other age groups, although they recognise and used technology to source resources for teaching, also had participants that used it rarely or only sometimes.

Age Years	Never Rarely	Sometime	Often	All the time	Total Number
=<29			7	21	28
30 – 39	2	7	19	32	60
40 – 49	1	7	26	35	69
=>50		5	33	33	71

Appendix E Table 13: Participants' attitudes to the frequency of use of technology to collect resources to be used in class teaching by age.

The results of a one-way between subjects' ANOVA in table 14 indicate that age resulted in a statistically significant outcome when examining "using applications to prepare exercises for students".

Condition	Results
Age (n-226)	[F(3,223)=4.253, p=.006]
Subject Area (n=226)	[F(3,223)=.459, p=.711]
Teacher Experience (n=225)	[F(3,222)=.175, p=.913]

Appendix E Table 14: Participants' attitudes to engagement with and use of technology to prepare tasks for students. ANOVA results by Age, Subject Area and Teaching Experience.

The results in table 15 suggest that younger participants had higher levels that used technology to prepare tasks for students. The results indicate that the respondents within the lower age range proportionally were more likely to use applications often or all the time to prepare tasks or exercises for students.

Age Years	Never Rarely	Sometimes	Often	All the time	Total Number
=<29	1	3	7	17	28
30 – 39	2	11	16	30	59
40 – 49	2	11	31	25	69
=>50	5	11	34	21	71

Appendix E Table 15: Participants' attitudes to the frequency of use of technology to prepare tasks for students by age.

The results of a one-way between subjects' ANOVA in table 16 indicate that age and subject areas resulted in a statistically significant outcome when examining the use of resources collected from existing educational sources in classroom delivery and teaching.

Condition	Results
Age (n-223)	[F(1,222)=5.795, p=.017]
Subject Area (n=223)	[F(1,222)=8.327, p=.004]
Teaching Experience (n=222)	[F(1,221)=1.893, p=.170]

Appendix E Table 16: Teacher use of resources collected from existing educational sources in classroom delivery and teaching. ANOVA results by Age, Subject Area and Teaching Experience.

The frequency table 17 indicates that all respondents in the youngest age group use resources collected from exiting educational sources in their classroom delivery and teaching. The results are shown in Table 17 below.

Age Years	Yes	No	Total Number
=<29	28		28
30 – 39	53	6	59
40 – 49	61	7	68
=>50	62	7	69

Appendix E Table 17: Frequency table showing number of participants who collect resources from existing educational sources in classroom delivery and teaching by age.

The one-way between subjects' ANOVA results shown in Table 18 below indicate that participants in subject areas Vocational Related and Academic subject areas had higher levels of participants using resources collected from existing educational sources for use in classroom delivery and teaching.

Subject Areas	Yes	No	Total Number
Academic	57	1	58
Engineering	26	4	30
Vocational Specific	67	5	72
Higher Ed.	12	2	14
Vocational Related	12		12
Computing & Design	21	4	25
Student Support	9	4	13

Appendix E Table 18: Frequency table showing number of participants who collect resources from existing educational sources in classroom delivery and teaching by subject area.

Results of the one-way ANOVA showing statistical significance on "Teachers perceptions of barriers that could adversely affect the integration of Technology into teaching practice"

The one-way between subjects' ANOVA test results shown in table 19 indicate that there is a statistically significant difference between the perceptions of the respondents in different age groups as to what degree they perceived a lack of computers in the classroom to be a barrier to integrating technology into teacher practice.

Condition	Results
Age (n-228)	[$F(3,225)=3.456$, $p=.017$]
Subject Area (n=228)	[$F(3,225)=2.026$, $p=.111$]
Teaching Experience (n=227)	[$F(3,224)=.937$, $p=.423$]

Appendix E Table 19: Participants' attitudes to the number of computers present in the classroom as a potential barrier to the integration of technology into teacher practice by Age, Subject Area and Teaching Experience.

Table 20 shows that some of the younger age groups perceive this to be more of a barrier than participants in the older age groups.

Age Years	Not at all	A little	Partially	A lot	Total Number
=<29	1	8	9	10	28
30 – 39	6	11	21	22	60
40 – 49	8	24	21	17	70
=>50	14	24	18	15	71

Appendix E Table 20: Participants' attitudes to the number of computers present in the classroom as a potential barrier to the integration of technology into teacher practice by age.

The results displayed in table 21 indicate that there is a statistically significant difference between the perceptions of participants in different subject areas to the issue of insufficient bandwidth as a barrier to technology integration into teacher practice.

Condition	Results
Age (n=228)	[$F(3,225)=2.453, p=.064$]
Subject Area (n=228)	[$F(3,225)=4.023, p=.008$]
Teaching Experience (n227)	[$F(3,224)=.312, p=.817$]

Appendix E Table 21: Is insufficient bandwidth perceived as a barrier to technology integration into teacher practice? ANOVA results by Age, Subject Area and Teaching Experience.

Within Academic subjects and Vocational Specific subjects' respondents perceived insufficient bandwidth to be more of a barrier to technology integration as shown in Table 22. More participants from these subject areas indicating that lack of bandwidth was at least a partial barrier, most of the other subject areas were almost equally split between it being a barrier and it being little or no barrier. The reliability issues regarding infra-structure and bandwidth were highlighted in all areas during the interviews (section 5.2.6) as being an issue that deterred teachers from using technology as it often resulted in additional work to produce an alternative back-up strategy for when the technology did fail.

Subject Area	Not at all	A little	Partially	A lot	Total Number
Academic	7	13	21	19	60
Engineering	6	9	6	10	31
Vocational Specific	9	16	23	24	72
Higher Ed.	4	6	2	3	15
Vocational Related	2	4	4	2	12
Computing & Design	7	9	7	3	26

Appendix E Table 22: Participant attitudes to the availability of adequate bandwidth as a barrier to the integration of technology into teacher practice by subject area.

The one-way between subjects' ANOVA test results shown in table 23 indicate that there is a statistically significant difference between the perceptions of participants in different age groups and subject areas to the issue of insufficient number of portable devices as a barrier to technology integration into teacher practice.

Condition	Results
Age (n-226)	[F(3,223)=2.979, p=.034]
Subject Area (n=226)	[F(3,223)=3.003, p=.031]
Teaching Experience (n=225)	[F(3,222)=2.158, p=.094]

Appendix E Table 23: Is insufficient number of portable devices perceived to be a barrier to technology integration into teacher practice? ANOVA results by Age, Subject Area and Teaching Experience

Table 24 shows that respondents under the age of 40 years considered insufficient portable devices to be at least a partial barrier to integration whereby participants 40 years and over considered it to be less of a barrier.

Age Years	Not at all	A little	Partially	A lot	Total Number
=<29	3	6	10	9	28
30 – 39	9	9	27	15	60
40 – 49	15	20	19	14	68
=>50	19	19	20	13	71

Appendix E Table 24: Participant attitudes to the availability of portable devices as a barrier to the integration of technology into teacher practice by age.

Table 25 indicates that academic subjects, Academic and vocational specific subject areas indicated that a lack of portable devices was at least a partial barrier to technology integration into classroom practices.

Subject Area	Not at all	A little	Partially	A lot	Total Number
Academic	9	17	23	11	60
Engineering	8	7	8	8	31
Vocational Specific	8	15	28	21	72
Higher Ed.	1	4	6	4	15
Vocational Related	4	3	3	4	14
Computing & Design	12	4	6	3	25
Student Support	6	3	1	3	13

Appendix E Table 25: Participant attitudes to the availability of portable devices as a barrier to the integration of technology into teacher practice by subject area.

The results presented in table 26 indicate that there is a statistically significant difference between the perceptions of respondents in different age groups to the issue of lack of pedagogical models as a barrier to technology integration into teacher practice.

Condition	Results
Age (n-226)	[*F*(3,223)=4.101, *p*=.007]
Subject Area (n=226)	[*F*(3,223)=.533, *p*=.660]

Appendix E Table 26: Is a lack of pedagogical models perceived to be a barrier to technology integration into teacher practice? ANOVA results by Age, Subject Area and Teaching Experience.

The results presented in table 27 indicate respondents in the older age groups considered lack of pedagogical models to be at least a partial barrier to the integration of technology.

Age Years	Not at all	A little	Partially	A lot	Total Number
=<29	15	11	1	1	28
30 – 30	21	26	8	3	58
40 – 49	28	26	12	4	70
=>50	22	22	19	8	71

Appendix E Table 27: Participant attitudes to pedagogical models as a barrier to the integration of technology into teacher practice by age.

The results shown in table 28 indicate that there is a statistically significant difference between the perceptions of respondents in different subject areas to the issue of pressure to prepare students for assessments and examinations as a barrier to technology integration into teacher practice.

Condition	Results
Age (n-222)	[*F*(3,219)=1.275, *p*=.284]
Subject Area (n=222)	[*F*(3,201)=3.286, *p*=.022]
Teacher Experience (n=221)	[*F*(3,218)=.918, *p*=.433]

Appendix E Table 28: Is the pressure to prepare students for examinations perceived to be a barrier to technology integration into teacher practice? ANOVA results by Age, Subject Area and Teaching Experience.

The results in table 29 indicate that this was perceived to be more of a barrier in Academic subjects.

Subject Area	Not at all	A little	Partially	A lot	Total Number
Academic	18	10	18	13	59
Engineering	8	9	7	5	29
Vocational Specific	27	24	16	4	71
Higher Ed.	8	6		1	15
Vocational Related	6	3	2	1	12
Computing & Design	12	3	7	2	24
Student Support	6	5	1	1	13

Appendix E Table 29: Participant attitudes to pressure for assessment or examination preparations as a barrier to the integration of technology into teacher practice by subject area.

Results of the one-way between subjects' ANOVA showing statistical significance of "Teacher participation in technology related Continued Professional Development (CPD) courses."

The ANOVA results in table 30 indicate that there is a statistically significant difference between the perceptions of the respondents in different age groups, subject areas and teaching experience to their participation in introductory level courses in computer and internet use.

Condition	Results
Age (n-228)	[F(1,227)=24.473, p=<.001]
Subject Area (n=228)	[F(1,227)=4.577, p=.033]
Teaching Experience (n=228)	[F(1,226)=8.489, p=.004]

Appendix E Table 30: Participation in training courses in Introduction to computers and internet. ANOVA results by Age, Subject Area and Teaching Experience.

Respondents in the age groups 39 years and younger, as shown in table 31, were least likely to undertake introductory level courses on computer and internet use.

Age Years	Yes	No	Total Number
=<29	8	20	28
30 – 39	26	34	60
40 – 49	45	25	70
=>50	52	19	71

Appendix E Table 31: Number of participants who attended CPD courses in introduction to computer and internet use by age.

Table 32 shows respondents with less than 11years of teaching experience were the least likely to participate in courses in introduction to computer and internet use. Teachers with 11 years or more of teaching experience were much more likely to undertake the training course than not participate in the training courses.

Teaching Experience Years	Yes	No	Total Number
=<1	5	5	10
1 - 3	17	16	33
4 – 10	40	48	88
11 – 20	47	23	70
=>21	21	6	27

Appendix E Table 32: Frequency table showing number of participants who attended CPD courses in introduction to computer and internet use by teaching experience.

The ANOVA results in table 33 indicate that there is a statistically significant difference between the perceptions of the respondents with different levels of teaching experience to their participation in equipment specific courses.

Condition	Results
Age (n-226)	[F(1,225)=1.771, p=.185]
Subject Area (n=226)	[F(1,225)=1.678, p=.197]
Teaching Experience (n=225)	[F(1,224) =19.264, p=<.001]

Appendix E Table 33: Participation in training courses in equipment specific use. ANOVA results by Age, Subject Area and Teaching Experience.

Respondents with less than 11years of teaching experience were the least likely to participate in courses in equipment specific training, shown in table 34.

Teaching Experience Years	Yes	No	Total Number
=<1	2	8	10
1 - 3	17	16	33
4 – 10	47	39	86
11 – 20	59	11	70
=>21	19	8	27

Appendix E Table 34: Number of participants who attended CPD courses in equipment specific training by teaching experience.

The ANOVA results in table 35 indicate that there is a statistically significant difference between the perceptions of the respondents in age and teaching experience to their participation in subject specific courses using technology.

Condition	Results
Age (n-227)	[F(1,226)=4.013, p=.046]
Subject Area (n=227)	[F(1,226)=.013, p=.910]
Teaching Experience (n=226)	[F(1,225)=4.411, p=.037]

Appendix E Table 35: Participation in training on subject specific training courses using technology and learning apps. ANOVA results by Age, Subject Area and Teaching Experience.

As shown in table 36 respondents in the age groups 39 years and younger, as shown in table 37, were least likely to undertake subject specific training using technology. Teachers aged 40 years and over were more likely to participate in subject specific training courses than not participate.

Age Years	Yes	No	Total Number
=<29	11	17	28
30 – 39	30	29	59
40 – 49	47	23	70
=>50	42	29	71

Appendix E Table 36: Number of participants who attended CPD courses on subject specific training by age.

Teachers with less than 11years of teaching experience were the least likely to participate subject specific training in using technology table 37.

Teaching Experience Years	Yes	No	Total Number
=<1	4	6	10
1 - 3	17	16	33
4 – 10	44	43	87
11 – 20	47	23	70
=>21	17	10	27

Appendix E Table 37: Number of participants who attended CPD courses on subject specific training by teaching experience.

The ANOVA results indicate in table 38 that there is a statistically significant difference between the perceptions of the respondents in age and teaching experience to their participation in In-House training.

Condition	Results
Age (n-222)	[F(1,221)=5.545, p=.019]
Subject Area (n=222)	[F(1,221)=.062, p=.804]
Teaching Experience (n=221)	[F(1,221)=11.874, p=.001]

Appendix E Table 38: Participation in courses through In-House training. ANOVA results by Age, Subject Area and Teaching Experience.

Respondents aged 39 years and younger were less likely to participate in in-house training courses than respondents aged 40 years and over shown in table 39.

Age Years	Yes	No	Total Number
=<29	11	17	28
30 – 39	28	31	59
40 – 49	35	33	68
=>50	43	25	68

Appendix E Table 39: Number of participants who attended CPD courses through In-House training by age.

Table 40 shows that respondents with less than 11years of teaching experience were the least likely to participate in In-House training. Respondents with 11 years or more teaching experience were more likely to undertake in-house training courses.

Teaching Experience Years	Yes	No	Total Number
=<1	4	6	10
1 - 3	10	23	33
4 – 10	43	43	87
11 – 20	42	25	67
=>21	18	8	26

Appendix E Table 40: Number of participants who attended CPD courses through In-House training by teaching experience.

The ANOVA results indicate in table 41 that there is a statistically significant difference between the perceptions of the respondents in age and teaching experience to their participation in externally provided training.

Condition	Results
Age (n-225)	[F(1,224)=7.734, p=.006]
Subject Area (n=225)	[F(1,224)=.411, p=.522]
Teaching Experience (n=224)	[F(1,223)=16.336, p=<.001]

Appendix E Table 41: Participation in courses provided from sources other than though In-House training. ANOVA results by Age, Subject Area and Teaching Experience.

Responses shown in table 42 indicate that teachers in the age groups 39 years and younger, were least likely to undertake training from other sources than In-House training.

Age Years	Yes	No	Total Number
=<29	15	12	27
30 – 30	31	28	59
40 – 49	37	33	70
=>50	55	15	70

Appendix E Table 42: Number of participants who attended CPD courses provided from sources other than through In-House training by age.

Respondents with less than 11years of teaching experience were the least likely to participate in Training provided from sources other than In-House. Participants with more than 11years teaching experience are more likely to participate in CPD courses from sources other than in-house as shown in table 43.

Teaching Experience Years	Yes	No	Total Number
=<1	5	5	10
1 - 3	15	18	33
4 – 10	46	40	86
11 – 20	48	22	70
=>21	24	2	26

Appendix E Table 43: Number of participants who attended CPD courses provided from sources other than through In-House training by teaching experience.

Results of on-way between subject ANOVA showing no statistical significance Teacher self-efficacy in general tasks incorporating technology.

Confidence create a database.

A one-way between subjects' ANOVA was conducted to compare means exploring whether there is a statistically significant difference in the means values of the number of respondents "confident creating a database" by Location, Age, Gender, Subject Area and Teaching Experiences.

There was a significant effect of age regarding ability to create a database at the *p*=<.05 level, [*F*(2,222)=3.159, *p*=.026]. The results presented in Table 44 together with the values in Table 45 suggest that participants in the lowest age group were more confident in being able to create a database while the participants aged 40 years and over were the least confident in this particular task.

No significant effects were shown regarding a participant's location, gender, subject area or teaching experience in the number of participants confidence in being able to create a database. The results are shown in Table 44 below.

Condition	Results
Location (n=225)	[*F*(3,222)=.120, *p*=.948]
Age (n-225)	[*F*(3,222)=3.159, *p*=.026]
Gender (n=210)	[*F*(3,207)=1.081, *p*=.358]
Subject Area (n=225)	[*F*(3,222)=2.308, *p*=.077]
Teaching Experience (n=224)	[*F*(3,2212)=1.316, *p*=.270]

Appendix E Table 44: Teacher self-efficacy in creating a database by Location, Age, Gender, Subject Area and Teaching Experience.

The frequency table indicates that all respondents in the youngest age group were more confident of being able to create a database and the participants in the 40 years and older age groups were least confident of creating a database. The results are shown in Table 45 below.

Age Years	None	A little	somewhat	A lot
=<29	2	6	9	11
30 – 30	8	19	16	14
40 – 49	15	22	16	20
=50	21	19	15	16

Appendix E Table 45: Frequency table showing number of participants who were able to create a database by age.

Confidence creating an online questionnaire.

A one-way between subjects' ANOVA was conducted to compare means exploring whether there is a statistically significant difference in the means values of the number of respondents who are "confident in creating an online questionnaire" by Location, Age, Gender, Subject Area and Teaching Experiences.

No significant effects were shown regarding location, gender or teaching experience in the number of participants using resources collected from existing educational sources in classroom delivery or teaching. The results are shown in Table 46 below.

Condition	**Results**
Location (n=225)	[F(3,222)=.162, p=.922]
Age (n-225)	[F(3,222)=8.038, p=.001]
Gender (n=210)	[F(3,207)=.394, p=.757]
Subject Area (n=225)	[F(3,222)=4.576, p=.004]
Teaching Experience (n=224)	[F(3,221)=1.832, p=.142]

Appendix E Table 46: Teacher self-efficacy showing participants able to create an online questionnaire by Location, Age, Gender, Subject Area and Teaching Experience.

The frequency table indicates that participants in age groups 39 years and younger were more confident in being able to create an on-line questionnaire than were the participants aged 40 years and over. The respondents in the older age groups had the most participants with little or no confidence in this task. The results are shown in Table 47 below.

Age Years	None	A little	Somewhat	A lot
=<29		1	8	19
30 – 30	2	11	16	29
40 – 49	5	23	16	26
=50	13	15	22	20

Appendix E Table 47: Frequency table showing number of participants who have confidence in creating an online questionnaire by age.

The frequency table indicates that participants in Computing and Design, Academic and Vocational Specific subject areas had high numbers of participants with confidence levels of "somewhat" or above, the Higher Education subject area showed the only participants that had more respondents with little or no confidence in this task than possessed confidence at "somewhat" or a lot. The results are shown in Table 48 below.

Subject Areas	None	A little	Somewhat	A lot
Academic	6	13	17	23
Engineering	4	8	10	9
Vocational Specific	6	19	23	22
Higher Ed.	2	7	2	4
Vocational Related		2	2	8
Computing & Design	1	1	4	20
Student Support	1		4	8

Appendix E Table 48: Frequency table showing number of participants who collect resources from existing educational sources in classroom delivery and teaching by subject area.

Confidence in emailing files.

A one-way between subjects' ANOVA was conducted to compare means exploring whether there is a statistically significant difference in the means values of the number of respondents who are "confident in emailing files" by Location, Age, Gender, Subject Area and Teaching Experiences.

The results presented in Table 49 together with the values in Table 50 suggest that participants in the oldest age group had the least confidence in emailing files. Participants in Computing and Design subject areas had the most confidence in emailing files.

No significant effects were shown regarding location, age, subject area or teaching experience in the number of participants confident in emailing files. The results are shown in Table 49 below.

Condition	**Results**
Location (n=226)	[F(2,224)=.570, p=.567]
Age (n-226)	[F(2,224)=1.799, p=.168]
Gender (n=211)	[F(2,209)=.4.929, p=.008]
Subject Area (n=226)	[F(2,224)=.613, p=.543]
Teaching Experience (n=225)	[F(2,223)=.915, p=.402]

Appendix E Table 49: Teacher self-efficacy in emailing files by Location, Age, Gender, Subject Area and Teaching Experience.

Check results from participants who did not indicate gender.

The frequency table indicates that respondents in the oldest age group have the least confidence in creating an online questionnaire and the youngest age group had most confidence. The results are shown in Table 50 below.

Age Years	None	A little	Somewhat	A lot
=<29		1	8	19
30 – 30	2	11	16	29
40 – 49	5	23	16	26
=50	13	15	22	20

Appendix E Table 50: Frequency table showing number of participants who have confidence in creating an online questionnaire by age.

Confidence in creating a presentation containing simple animation.

A one-way between subjects' ANOVA was conducted to compare means exploring whether there is a statistically significant difference in the means values of the number of respondents who are "confident in creating a presentation with simple animation" by Location, Age, Gender, Subject Area and Teaching Experiences.

There was a significant effect of age on teacher self-efficacy in being able to create a presentation containing simple animation at the p=<.05 level [F(3,224)=3.329, p=.020]. The results presented in Table 51 together with the values in Table 52 suggest that participants in the youngest age group had the most confidence in creating a presentation with simple animation although within all age groups most participants responded that they were somewhat confident in performing this task. There were a small number of participants across three age groups that reported no confidence in being able to create a presentation using simple animation.

No significant effects were shown regarding location, gender, subject area or teaching experience in the number of participants confident in creating a presentation containing simple animation. The results are shown in Table 51 below.

Condition	**Results**
Location (n=227)	[F(3,224)=.312, p=.816]
Age (n-227)	[F(3,224)=3.329, p=.020]
Gender (n=212)	[F(3,209)=.530, p=.662]
Subject Area (n=227)	[F(3,224)=1.643, p=.180]
Teaching Experience (n=226)	[F(3,223)=1.837, p=.141]

Appendix E Table 51: Teacher self-efficacy in being able to create a presentation containing simple animation by Location, Age, Gender, Subject Area and Teaching Experience.

The frequency table indicates that participants in the youngest age group had the most confidence in creating a presentation with simple animation although within all age groups most participants responded that they were somewhat confident in performing this particular task. There were a small number of participants across three age groups that reported no confidence in being able to create a presentation using simple animation. The results are shown in Table 52 below.

Age Years	None	A little	Somewhat	A lot
=<29		1	2	25
30 – 30	2		8	49
40 – 49	3	4	15	48
=50	2	5	18	46

Appendix E Table 52: Frequency table showing number of participants who have confidence in creating a presentation with simple animation by age.

Confidence create a presentation containing video.

A one-way between subjects' ANOVA was conducted to compare means exploring whether there is a statistically significant difference in the means values of the number of respondents who are "confident in creating a presentation containing video" by Location, Age, Gender, Subject Area and Teaching Experiences.

There was a significant effect of age on teacher self-efficacy in being able to create a presentation containing video at the p=<.05 level [F(3,223)=5.541, p=.001]. The results presented in Table 53 together with the values in Table 54 suggest that participants in the youngest age group reported high levels of participants who were somewhat or more confident in this task, there was a slight increase in the number of participants who had little or no confidence in creating a presentation containing video.

No significant effects were shown regarding location, gender, subject area or teaching experience in the number of participants in the number of participants confident in creating a presentation containing video. The results are shown in Table 53 below.

Condition	**Results**
Location (n=226)	[*F*(3,223)=.167, *p*=.919]
Age (n-226)	[*F*(3,223)=5.541, *p*=.001]
Gender (n=211)	[*F*(3,208)=.232, *p*=.874]
Subject Area (n=226)	[*F*(3,223)=2.429, *p*=.066]
Teaching Experience (n=225)	[*F*(3,222)=.691, *p*=.558]

Appendix E Table 53: Teacher self-efficacy in being able to create a presentation containing video by Location, Age, Gender, Subject Area and Teaching Experience.

The frequency table indicates that respondents in the youngest age group reported high levels of participants who were somewhat or a lot confident in this task, there was a slight increase in the number of participants who had little or no confidence in creating a presentation containing video. The results are shown in Table 54 below.

Age Years	None	A little	Somewhat	A lot
=<29		2	1	25
30 – 30		3	9	46
40 – 49	4	5	13	48
=50	4	9	19	39

Appendix E Table 54: Frequency table showing number of participants who have confidence in creating a presentation containing video by age.

Confidence participating in a professional online forum.

A one-way between subjects' ANOVA was conducted to compare means exploring whether there is a statistically significant difference in the means values of the number of respondents who participate in a professional online forum by Location, Age, Gender, Subject Area and Teaching Experiences.

There was a significant effect of age on teacher participation in professional online forums at the *p*=<.05 level [*F*(3,222)=9.879, *p*=.001]. The results presented in Table 55 together with the values in Table 56 suggest that participants in the age groups of 39 years or younger had more confidence in creating a participating in a professional on-line forum, as the age of the participants increased the confidence level for taking part in on-line professional forums decreased.

No significant effects were shown in regard to location, gender, subject area or teaching experience in the number of participants taking part in professional online forums. The results are shown in Table 55 below.

Condition	**Results**
Location (n=225)	[*F*(3,222)=.673, *p*=.570]
Age (n-225)	[*F*(3,222)=9.879, *p*=.001]
Gender (n=210)	[*F*(3,207)=1.677, *p*=.173]
Subject Area (n=225)	[*F*(3,222)=1.704, *p*=.167]
Teaching Experience (n=224)	[*F*(3,221)=1.815, *p*=.145]

Appendix E Table 55: Teacher self-efficacy in participating in professional online forums by Location, Age, Gender, Subject Area and Teaching Experience.

The frequency table indicates that respondents in the participants in the age groups of 39 years and younger had more confidence in participating in a professional on-line forum than did the participants in the age groups 40 years and over in participating in professional online forums, as the age of the participants increased the confidence level for taking part in on-line professional forums decreased. The results are shown in Table 56 below.

Age Years	None	A little	Somewhat	A lot
=<29	1	1	3	23
30 – 30	6	6	15	31
40 – 49	7	10	23	29
=50	10	20	21	20

Appendix E Table 56: Frequency table showing number of participants who have confidence taking part in professional online forums by age.

Confidence in creating or maintaining a blog or website.

A one-way between subjects' ANOVA was conducted to compare means exploring whether there is a statistically significant difference in the means values of the number of respondents who are "confident in maintaining a blog or website" by Location, Age, Gender, Subject Area and Teaching Experiences.

There was a significant effect of age on confidence maintaining a blog or website at the p=<.05 level [F(3,223)=16.008, p=<.001], subject area at the p=<.05 level [F(3,223)=2.842, p=0.039] and teaching experience at the p=<.05 level [F(3,222)=4.539, p=0.004]. The results presented in Table 57 together with the values in Table 58, Table 59 and Table 60 suggest that participants in the oldest the age group the least self-efficacy in creating or maintaining a blog or website. Female participants had more respondents indicating no confidence, but also had more participants that were somewhat confident or a lot confident compared to the male participants. Participants in Computing and Design and Academic subject areas had the most confidence in creating and maintaining a blog or website while Vocational specific subjects had the least confidence. The results indicated that participants with between 1-3 years of experience had more confidence in maintaining a blog or website, most other levels of experience were almost equally balance in participant confidence levels with the exception of participants with 11-20 years of experience where more participants responded with having little or no confidence in this particular task.

No significant effects were shown regarding location, in the number of participants confident in maintaining a blog or website. The results are shown in Table 57 below.

Condition	**Results**
Location (n=226)	[F(3,223)=.345, p=.793]
Age (n-226)	[F(3,223)=16.008, p=.001]
Gender (n=211)	[F(3,208)=2.694, p=.047]
Subject Area (n=226)	[F(3,223)=2.842, p=.039]
Teaching Experience (n=225)	[F(3,222)=4.539, p=.004]

Appendix E Table 57: Teacher self-efficacy in being able to create or maintain a blog or website by Location, Age, Gender, Subject Area and Teaching Experience.

The frequency table indicates that youngest age group reported more confidence in being able to maintain a blog or website, as the age or the participant increased then so did the number of participants reporting no confidence in this particular task. Participants in the age groups 40 years and over had the lowest level of self-efficacy in creating or maintaining a blog or website. The results are shown in Table 58 below.

Age Years	None	A little	Somewhat	A lot
=<29		4	6	18
30 – 30	13	7	18	20
40 – 49	20	20	13	17
=50	29	23	11	8

Appendix E Table 58: Frequency table showing number of participants who have confidence in creating or maintaining a blog or website by age.

The frequency table indicates that Participants in Computing and Design and Academic subject areas had the most confidence in creating and maintaining a blog or website while Vocational specific subjects had the least confidence. the Computing & Design and Academic subject areas there was a high level of respondents confident in being able to create and maintain a blog or website the Vocational specific and Engineering subject areas had the highest number of participants reporting little or no confidence in this task. The results are shown in Table 59 below.

Subject Areas	None	A little	Somewhat	A lot
Academic	15	9	14	20
Engineering	11	11	3	6
Vocational Specific	24	21	18	8
Higher Ed.	6	4	3	2
Vocational Related	2	3	3	4
Computing & Design		3	5	18
Student Support	3	3	2	5

Appendix E Table 59: Frequency table showing number of participants who have confidence in creating or maintaining a blog or website by subject area.

The frequency table indicates that participants The results indicated that participants with between 1-3 years of experience had more confidence in maintaining a blog or website, most other levels of experience were almost equally balance in participant confidence levels with the exception of participants with 11-20 years of experience where more participants responded with having little or no confidence in this particular task The results are shown in Table 60 below.

Teaching Experience Years	None	A little	Somewhat	A lot
=<1	4	1		5
1 - 3	2	5	13	13
4 – 10	25	18	14	29
11 – 20	24	21	13	12
=>21	6	9	8	4

Appendix E Table 60: Frequency table showing number of participants who have confidence in creating or maintaining a blog or website by teaching experience.

Confidence in participating in a social network.

A one-way between subjects' ANOVA was conducted to compare means exploring whether there is a statistically significant difference in the means values of the number of respondents who are "confident in participating in social network" by Location, Age, Gender, Subject Area and Teaching Experiences.

There was a significant effect of age on confidence participating in social network at the p=<.05 level [F(3,223)=17.339, p=<.001]. The results presented in Table 61 together with the values in Table 62suggest that participants in the age groups of 39 years and less had more self-efficacy in participating in social networks than participants on older age groups.

No significant effects were shown in regard to subject area and teaching experience in the confidence of participants in participating in social networks. The results are shown in Table 61 below.

Condition	Results
Location (n=226)	[F(3,223)=1.205, p=.309]
Age (n-226)	[F(3,223)=17.339, p=.001]
Gender (n=211)	[F(3,208)=2.784, p=.042]
Subject Area (n=226)	[F(3,223)=2.552, p=.056]
Teaching Experience (n=225)	[F(3,222)=1.517, p=.211]

Appendix E Table 61: Teacher self-efficacy in being able to participate in social network by Location, Age, Gender, Subject Area and Teaching Experience.

The frequency table indicates that participant's self-efficacy decreased as the age group increased. The level of confidence fell as the age increased. The results as shown in Table 62 below.

Age Years	None	A little	Somewhat	A lot
=<29			2	26
30 – 30	2	4	10	42
40 – 49	7	15	12	36
=50	19	15	13	24

Appendix E Table 62: Frequency table showing number of participants who have confidence in participating in social network by age.

Confidence in downloading computer software.

A one-way between subjects' ANOVA was conducted to compare means exploring whether there is a statistically significant difference in the means values of the number of respondents who are "confident in downloading computer software" by Location, Age, Gender, Subject Area and Teaching Experiences.

There was a significant effect of age on confidence in downloading computer software at the p=<.05 level [F(3,223)=5.051, p=.002]. The results presented in Table 63 together with the values in Table 64 suggest that participants in the older the age group the less self-efficacy in downloading computer software.

No significant effects were shown regarding location, subject area and teaching experience in the number of participants confident in downloading computer software. The results are shown in Table 63 below.

Condition	Results
Location (n=226)	[*F*(3,223)=1.789, *p*=.150]
Age (n-226)	[*F*(3,223)=5.051, *p*=.002]
Gender (n=211)	[*F*(3,208)=2.788, *p*=.042]
Subject Area (n=226)	[*F*(3,223)=.945, *p*=.420]
Teaching Experience (n=225)	[*F*(3,222)=1.475, *p*=.222]

Appendix E Table 63: Teacher self-efficacy in being able to download computer software by Location, Age, Gender, Subject Area and Teaching Experience.

The frequency table indicates that participants progressively reported less self-efficacy in downloading computer software as the age of the groups increased. The results are shown in Table 64 below.

Age Years	None	A little	Somewhat	A lot
=<29	1		3	24
30 – 30	6	5	8	39
40 – 49	7	10	19	34
=50	10	13	13	35

Appendix E Table 64: Frequency table showing number of participants who have confidence in downloading software by age.

Confidence in downloading resources from websites or learning platforms.

A one-way between subjects' ANOVA was conducted to compare means exploring whether there is a statistically significant difference in the means values of the number of respondents who are "confident in downloading resources from websites or learning platforms" by Location, Age, Gender, Subject Area and Teaching Experiences.

There was a significant effect of age on confidence in downloading resources from websites and learning platforms at the *p*=<.05 level [*F*(3,223)=4.703, *p*=.003]. The results presented in Table 65 together with the values in Table 66 suggest that participants in the younger age group had more self-efficacy in downloading resources from websites and learning platforms.

No significant effects were shown in regard to location, gender, subject area and teaching experience in the number of participants confident in downloading resources from websites and learning platforms. The results are shown in Table 65 below.

Condition	Results
Location (n=226)	[*F*(3,223)=1.689, *p*=.170]
Age (n-226)	[*F*(3,223)=4.703, *p*=.003]
Gender (n=211)	[*F*(3,208)=.242, *p*=.867]
Subject Area (n=226)	[*F*(3,223)=1.141, *p*=.333]
Teaching Experience (n=225)	[*F*(3,222)=.590, *p*=.622]

Appendix E Table 65: Teacher self-efficacy in being able to download resources from websites and learning platforms by Location, Age, Gender, Subject Area and Teaching Experience.

The frequency table indicates that respondents in the younger age group had greater level of self-efficacy for downloading resources from websites and learning platforms. The results are shown Table 66 below.

Age Years	None	A little	Somewhat	A lot
=<29			2	26
30 – 30	1	3	13	41
40 – 49	3	9	15	43
=50	5	10	15	41

Appendix E Table 66: Frequency table showing number of participants who have confidence in downloading resources from websites and learning platforms by age.

Confidence in preparing materials for interactive whiteboards.

A one-way between subjects' ANOVA was conducted to compare means exploring whether there is a statistically significant difference in the means values of the number of respondents who are "confident in preparing materials for interactive whiteboards" by Location, Age, Gender, Subject Area and Teaching Experiences.

There was a significant effect of age at the *p*=<.05 level [*F*(3,223)=2.982, *p*=.032] and teaching experience at the *p*=<.05 level [*F*(3,225)=3.299, *p*=.021]. The results presented in Table 67 together with the values in Table 68 and Table 69 suggest that the older the age of the participant the less self-efficacy in this task preparing materials for interactive whiteboards. Participants with more than 4 years, but less than 21 years teaching experience had more self-efficacy in preparing materials for use with interactive whiteboards than did other participants.

No significant effects were shown regarding gender and subject area in the number of participants preparing materials for interactive whiteboards. The results are shown in Table 67 below.

Condition	**Results**
Location (n=226)	[F(3,223)=3.078, p=.028]
Age (n-226)	[F(3,223)=2.982, p=.032]
Gender (n=211)	[F(3,208)=.604, p=.613]
Subject Area (n=226)	[F(3,223)=2.196, p=.089]

Appendix E Table 67: Teacher self-efficacy in being able to preparing materials for interactive whiteboards. by Location, Age, Gender, Subject Area and Teaching Experience.

The frequency table indicates that proportionally as the age of the group progressed so did the self-efficacy of the participants in preparing for use with interactive whiteboards. The results are shown in Table 68 below.

Age Years	None	A little	Somewhat	A lot
=<29	3	2	4	19
30 – 30	5	11	9	33
40 – 49	9	10	22	29
=50	3	14	22	32

Appendix E Table 68: Frequency table showing number of participants who have confidence in preparing materials for interactive whiteboards by age.

The frequency table indicates that participants with more than 4 years but less than 21 years teaching experience had more self-efficacy in preparing materials for use with interactive whiteboards than did other participants. The results are shown in Table 69 below.

Teaching Experience (Years)	None	A little	Somewhat	A lot
=<1	1	2	6	10
1 - 3	1	5	7	20
4 – 10	10	15	17	44
11 – 20	7	10	21	32

Appendix E Table 69: Frequency table showing number of participants who have confidence in preparing materials for interactive whiteboards by teaching experience.

Summary table of statistical significance results concerning teacher self-efficacy performing tasks involving ICT.

The summary table below (Table 70) displays the results of the one-way between subjects' ANOVA tests conducted to compare means exploring whether there is a statistically significant difference in the means values of Location, Age, Gender, Subject Area and Teaching Experience for teacher self-efficacy on a number of tasks involving and using ICT.

The results indicate that of the 20 results showing statistical significance, ten results indicated that the independent variable age indicated a significant result, five of these results indicated that the independent variable was gender, two results indicated that the independent variable was subject area and teaching experience the other result was with independent variable location.

	Independent Variable showing statistical significance at the *p*=.05 level				
Condition	Location	Age	Gender	Subject Area	Teaching Experience
Create a database		[$F(2,222)=3.159$, $p=.026$].			
Create an online questionnaire		[$F(3,222)=4.576$, $p=0.004$]		[$F(3,222)=4.576$, $p=0.004$]	
Email files			[$F(2,209)=4.929$, $p=.008$]		
Create a presentation with simple animation.		[$F(3,224)=3.329$, $p=.020$]			
Creating a presentation with video		[$F(3,223)=5.541$, $p=.001$]			
Participating in a professional online forum		[$F(3,222)=9.879$, $p=.001$			
Create or maintain a blog or website		[$F(3,223)=16.008$, $p=<.001$]	[$F(3,208)=2.694$, $p=.047$]	[$F(3,223)=2.842$, $p=0.039$]	[$F(3,222)=4.539$, $p=0.004$].
Participating in social network		[$F(3,223)=17.339$, $p=<.001$]	[$F(3,208)=2.784$, $p=.042$].		
Downloading computer software		[$F(3,223)=5.051$, $p=.002$]	[$F(3,208)=2.788$, $p=.042$]		
Download resources from learning platform		[$F(3,223)=4.703$, $p=.003$].			
Preparing material for use with whiteboards	[$F(3,223)=3.078$, $p=.028$]	[$F(3,223)=2.982$, $p=.032$]			[$F(3,225)=3.299$, $p=.021$].
Programming			[$F(3,208)=4.180$, $p=.007$]		

Appendix E Table 70: Summary of test showing statistical significance for teacher self-efficacy in specific tasks using ICT.

Frequency and type of teacher engagement with technology in their teaching practice.

Using ICT to browse or search the internet for resources to be used during classroom practice.

A one-way between subjects' ANOVA was conducted to compare means exploring whether there is a statistically significant difference in the means values of the number of respondents who "use ICT to collect resources to be used during lesson" by Location, Age, Gender, Subject Area and Teaching Experiences.

There was a significant effect of age on using ICT integration to collect resources to be used during at the $p<.05$ level [$F(3,225)=3.654$, $p=.013$]. The results presented in Table 71 together with the values in Table 72 suggest that younger participants used ICT for this task in some way while all other age groups had one participant who never used ICT for this task.

No significant effects regarding location, subject area or teaching experience in the collection of resources to be used in classroom practice. The results are shown in Table 71 below.

Condition	**Results**
Location (n=228)	[$F(3,225)=.130$, $p=.942$]
Age (n-2225)	[$F(3,225)=3.654$, $p=.013$]
Gender (n=213)	[$F(3,210)=2.971$, $p=.0.33$]
Subject Area (n=225)	[$F(3,225)=1.126$, $p=.339$]
Teaching Experience (n=227)	[$F(3,224)=1.188$, $p=.315$]

Appendix E Table 71: Teacher engagement with ICT using apps to prepare presentations by Location, Age, Gender, Subject Area and Teaching Experience.

The frequency table indicates that respondents in the youngest age group use the internet to source resources for use during lessons to some degree. The results are shown in Table 72 below.

Age Years	Never Rarely	Sometime	Often	All the time
=<29			7	21
30 – 30	2	7	19	32
40 – 49	1	7	26	35
=50		5	33	33

Appendix E Table 72: Frequency table showing number of participants who engage with ICT to collect resources to be used in class teaching by age.

4.5.5 Using ICT to create their own digital materials.

A one-way between subjects' ANOVA was conducted to compare means exploring whether there is a statistically significant difference in the means values of the number of respondents who engaged in "creating their own digital materials" by Location, Age, Gender, Subject Area and Teaching Experiences.

There was a significant effect of subject area on ICT integration concerning respondents creating their own digital material at the $p<.05$ level [F(3,223=3.652, p=0.013]. The results presented in Table 73 together with the values in Table 74 suggest that participants in subject areas of computing and design had higher levels of participants creating their own digital learning material.

No significant effects regarding location, age or gender in the number of participants creating their own digital materials. The results are shown in Table 73 below.

Condition	Results
Location (n=226)	[F(3,223)=.548, p=.650]
Age (n-226)	[F(3,223)=1.131, p=.337]
Gender (n=211)	[F(3,208)=1.328, p=.266]
Subject Area (n=226)	[F(3,223)=3.652, p=.013]
Teaching Experience (n=225)	[F(3,222)=.196, p=.899]

Appendix E Table 73: Teacher engagement with ICT and creating their own digital material by Location, Age, Gender, Subject Area and Teaching Experience.

The frequency table indicates that within the Computing and design subjects there was a high level of respondents creating their own digital materials. Other subject areas were not shown to have a statistically significant influence on whether or not they created their own digital materials. The results are shown in Table 74 below.

Subject Areas	Never Rarely	Sometimes	Often	All the Time
Academic	11	17	20	10
Engineering	6	8	11	6
Vocational Specific	13	22	22	15
Higher Ed.	4	2	6	3
Vocational Related	1	5	4	2
Computing & Design		3	17	26
Student Support	8	3		2

Appendix E Table 74: Frequency table showing number of participants who engage with ICT to create their own digital material by subject area.

Using ICT to prepare exercises for students.

A one-way between subjects' ANOVA was conducted to compare means exploring whether there is a statistically significant difference in the means values of the number of respondents "using applications to prepare exercises for students" by Location, Age, Gender, Subject Area and Teaching Experiences.

There was a significant effect of age on ICT integration in respect to respondents using applications to prepare tasks or exercises for students at the $p<.05$ level [$F(4,203=3.77$, $p=0.006$]. The results presented in Table 75 together with the values in Table 76 suggest that younger participants had higher levels of participants that used ICT to prepare tasks for students. No significant effects regarding location, gender or subject specialisation in preparing tasks for students. The results are shown in Table 75 below.

Condition	**Results**
Location (n=226)	[$F(3,223)=1.702$, $p=.167$]
Age (n-226)	[$F(3,223)=4.253$, $p=.006$]
Gender (n=211)	[$F(3,208)=1.431$, $p=.235$]
Subject Area (n=226)	[$F(3,223)=.459$, $p=.711$]
Teacher Experience (n=225)	[$F(3,222)=.175$, $p=.913$]

Appendix E Table 75: Teacher engagement with ICT using applications to prepare tasks for students by Location, Age, Gender, Subject Area and Teaching Experience.

The frequency table indicates that the respondents within the lower age range proportionally were more likely to use applications all the time to prepare tasks or exercises for students. Location, gender, subject areas or teacher experience were not shown to have a statistically significant influence on whether or not they used ICT to prepare tasks for students. The results are shown in Table 76 below.

Age Years	Never Rarely	Sometimes	Often	All the time
=<29	1	3	7	17
30 – 30	2	11	16	30
40 – 49	2	11	31	25
=50	5	11	34	21

Appendix E Table 76: Frequency table showing number of participants who engage with ICT to prepare tasks for students by age.

Summary table of statistical significance results concerning frequency of use and types of interactions using ICT in classroom practices.

The summary table below (Table 77) displays the results of the one-way between subjects' ANOVA tests conducted to compare means exploring whether there is a statistically significant difference in the means values of Location, Age, Gender, Subject Area and Teaching Experience for how teachers use ICT in their teaching and classroom practice. The results indicate that of there are four results showing statistical significance, two results showed the independent variable was age, one was gender and one within subject areas with the independent variable producing the significant result.

	Independent Variable showing statistical significance at the *p*=<.05 level				
Condition	Location	Age	Gender	Subject Area	Teaching Experience
Using applications to prepare presentations		[*F*(3,225)=3.654, *p*=.013]	[*F*(3,210)=2.971, *p*=.0.33]		
Creating their own digital material				[*F*(3,223)=3.652, *p*=.013]	
Teachers using applications to prepare exercises for students		[*F*(3,223)=4.253, *p*=.006]			

Appendix E Table 77: Summary of interaction and engagement with ICT in teaching practice.

Types of ICT resources used in classroom delivery or teaching.

Introduction.

A number of one-way between subjects' ANOVA was conducted to compare means to exploring whether there is a statistically significant difference in the means values of Location, Age, Gender, Subject Area and Teaching Experience on the types and source of ICT resources used in classroom delivery or teaching.

Using resources from existing educational sources in classroom delivery and teaching.

A one-way between subjects' ANOVA was conducted to compare means exploring whether there is a statistically significant difference in the means values of the number of respondents who use "resources collected from existing educational sources in classroom delivery and teaching" by Location, Age, Gender, Subject Area and Teaching Experiences.

There was a significant effect of age on the use of resources collected from existing educational sources in classroom delivery and teaching at the $p<.05$ level [$F(1,222)=5.795$, $p=.017$] and of subject area at the $p<.05$ level [$F(1,222)= 8.327$, $p=0.004$]. The results presented in Table 78 together with the values in Table 79 and Table 80 suggest that participants in the lowest age group and in subject areas Vocational Related and Academic subject areas had higher levels of participants using resources collected from existing educational sources in classroom delivery and teaching.

No significant effects concerning location, gender or teaching experience in the number of participants using resources collected from existing educational sources in classroom delivery or teaching. The results are shown in Table 78 below.

Condition	Results
Location (n=223)	[$F(1,222)=5.795$, $p=.017$]
Age (n-223)	[$F(1,222)=1.387$, $p=.240$]
Gender (n=208)	[$F(1,207)=3.089$, $p=.080$]
Subject Area (n=223)	[$F(1,222)=8.327$, $p=.004$]
Teaching Experience (n=222)	[$F(1,221)=1.893$, $p=.170$]

Appendix E Table 78: Teacher use of resources collected from existing educational sources in classroom delivery and teaching by Location, Age, Gender, Subject Area and Teaching Experience.

The frequency table indicates that all respondents in the youngest age group use resources collected from exiting educational sources in their classroom delivery and teaching. The results are shown in Table 79 below.

Age Years	Yes	No
=<29	28	
30 – 30	53	6
40 – 49	61	7
=50	62	7

Appendix E Table 79: Frequency table showing number of participants who collect resources from existing educational sources in classroom delivery and teaching by age.

The frequency table indicates that within the Vocational Related and Academic subject areas there was a high level of respondents using resources collected from existing educational sources in classroom delivery and teaching. The results are shown in Table 80 below.

Subject Areas	Yes	No
Academic	57	1
Engineering	26	4
Vocational Specific	67	5
Higher Ed.	12	2
Vocational Related	12	
Computing & Design	21	4
Student Support	9	4

Appendix E Table 80: Frequency table showing number of participants who collect resources from existing educational sources in classroom delivery and teaching by subject area.

Summary table of statistical significance results concerning materials used in classroom delivery and teaching.

The summary table below (Table 81) displays the results of the one-way between subjects' ANOVA tests conducted to compare means exploring whether there is a statistically significant difference in the means values of Location, Age, Gender, Subject Area and Teaching Experience for the types of material used by teachers in their delivery and teaching. The results indicate that of there are three results showing statistical significance, one result showed the independent variable was location, one was age and one within subject areas with the independent variable producing the significant result.

	Independent Variable showing statistical significance at the *p*,=<05 level				
Condition	Location	Age	Gender	Subject Area	Teaching Experience
Using resources from existing educational sources		[$F(1,222)=5.795$, $p=.017$]		[$F(1, 222)= 8.327$, $p=0.004$].	
Using resources from the college network or database	[$F(1,222)=5.329$, $p=.022$].				

Appendix E Table 81: Summary of materials used by teachers in delivery and teaching.*Teachers' perceptions about potential barriers and factors that could adversely affect the integration of Technology into teaching practice:*

Introduction

Results of a number of one-way between subjects' ANOVA conducted to compare the effect of Location, Age, Gender, Subject Area and Teaching Experience on teacher perceptions about the potential adverse effect on the integration of ICT into their teaching practice using 18 identified barriers from previous research.

Integration of ICT is adversely affected by insufficient number of computers:

A one-way between subjects' ANOVA was conducted to compare means exploring whether there is a statistically significant difference in the mean values of the number of respondents who considered insufficient numbers of computers having an adverse effect on the integration of ICT into their teaching practice by Location, Age, Gender, Subject Area and Teaching Experience. The results are detailed in table 38 below.

There was a significant effect of age on ICT integration related to "insufficient number of computers" affecting adversely the integration of ICT in teaching practice at the p<.05 level [F (3,225) = 3.456, p=0.017]. The results presented in Table 82 together with the values in Table 83 suggest that younger participants perceive insufficient number of computers as possibly having an adverse effect on ICT integration.

There were no significant effects shown regarding location, gender, subject specialisations or teaching experience influencing whether participants considered this factor as having an adverse effect on ICT integration into their teaching practice. The results are shown in Table 82 below.

Condition	**Results**
Location (n=228)	[F(3,225)=1.390, p=.247]
Age (n-228)	[F(3,225)=3.456, p=.017]
Gender (n=213)	[F(3,210)=1.302, p=.275]
Subject Area (n=228)	[F(3,225)=2.026, p=.111]
Teaching Experience (n=227)	[F (3,224)=.937, p=.423]

Appendix E Table 82: Insufficient number of computers perceived to be a barrier to ICT integration into teacher practice by Location, Age, Gender, Subject Area and Teaching Experience.

The frequency table indicates that the younger participant, considered insufficient computer numbers to have an adverse effect on the integration of ICT in their classroom practice at a level of either "partially" or "a lot". No significant effects were shown in respect to location, gender, subject specialisation or teaching experience in whether they considered insufficient number of computers as adversely affecting ICT integration into their teaching practice. The results are shown in Table 83 below.

Age Years	Not at all	A little	Partially	A lot
=<29	1	8	9	10
30 – 30	6	11	21	22
40 – 49	8	24	21	17
=50	14	24	18	15

Appendix E Table 83: Frequency table showing number of participants who regarded insufficient number of computers to be a barrier to the integration of ICT into teacher practice by age.

Integration of ICT is adversely affected by insufficient bandwidth:

A one-way between subjects' ANOVA was conducted to compare means exploring whether there is a statistically significant difference in the mean values of the number of respondents who considered "insufficient bandwidth" and speed having an adverse effect on the integration of ICT into their teaching practice by Location, Age, Gender, Subject Area and Teaching Experience.

There was a significant effect of subject areas shown at the p=<.05 level [F(3,225)=4.023, p=.008] on insufficient bandwidth affecting the integration of ICT into teaching practice.

The results presented in Table 84 together with the values in Table 85 suggest that in the Yorkshire region and in the subject areas of Academic and Vocational Specific participants perceive insufficient bandwidth as possibly having an adverse effect on ICT integration. No significant effects in respect to age, gender or teaching experience in whether they regarded insufficient bandwidth as adversely affecting ICT integration into their teaching practice. The results are shown in Table 84 below.

Condition	**Results**
Location (n=228)	[F(3,225)=3.579, p=.015]
Age (n-228)	[F(3,225)=2.453, p=.064]
Gender (n=213)	[F(3,210)=.504, p=.680]
Subject Area (n=228)	[F(3,225)=4.023, p=.008]
Teaching Experience (n=227)	[F(3,224)=.312, p=.817]

Appendix E Table 84: Insufficient bandwidth is perceived to be a barrier to ICT integration into teacher practice by Location, Age, Gender, Subject Area and Teaching Experience.

The frequency table indicates that participants in the subject areas of Academic and Vocational Specific subjects considered insufficient bandwidth a greater barrier to the integration of ICT into classroom practice, reporting higher levels of either "partially" or "a lot", than other participants. No significant effects regarding location, gender or teaching experience. The results are shown in Table 85 below.

Subject Area	Not at all	A little	Partially	A lot
Academic	7	13	21	19
Engineering	6	9	6	10
Vocational Specific	9	16	23	24
Higher Ed.	4	6	2	3
Vocational Related	2	4	4	2
Computing & Design	7	9	7	3

Appendix E Table 85: Frequency table showing number of participants who perceived insufficient bandwidth to be a barrier to the integration of ICT into teacher practice by subject area.

Integration of ICT is adversely affected by insufficient number of portable devices:

A one-way between subjects' ANOVA was conducted to compare means exploring whether there is a statistically significant difference in the mean values of the number of respondents who perceived "insufficient number of portable devices" having adverse effect on the integration of ICT into their teaching practice by Location, Age, Gender, Subject Area and Teaching Experience.

There was a significant effect of age indicated at the p=<.05 level [F(3,223)=2.979, p=.034] and subject areas shown at the p=<.05 level [F(3,223)=3.003, p=.031] on "insufficient number of portable devices affecting the integration of ICT into teaching practice.

The results presented in Table 86 together with the values in Table 87 and Table 88 suggest in the subject areas of Academic and Vocational Specific, younger participants perceive insufficient number of portable devices as possibly having an adverse effect on ICT integration. No significant effects regarding teaching experience concerning insufficient number of portable devices as adversely affecting ICT integration into their teaching practice. The results are shown in Table 86 below.

Condition	**Results**
Location (n=226)	[$F(3,223)=2.869$, $p=.037$]
Age (n-226)	[$F(3,223)=2.979$, $p=.034$]
Gender (n=212)	[$F(3,209)=3.114$, $p=.027$]
Subject Area (n=226)	[$F(3,223)=3.003$, $p=.031$]
Teaching Experience (n=225)	[$F(3,222)=2.158$, $p=.094$]

Appendix E Table 86: Insufficient number of portable devices is perceived to be a barrier to ICT integration into teacher practice by Location, Age, Gender, Subject Area and Teaching Experience

The frequency table indicates that participants in the age range 30 - 39 years considered insufficient portable devices as possibly having an adverse effect on the integration of ICT into their teaching practice reporting a level of either "partially" or "a lot". The results are shown in Table 87 below.

Age Years	Not at all	A little	Partially	A lot
=<29	3	6	10	9
30 – 39	9	9	27	15
40 – 49	15	20	19	14
=>50	19	19	20	13

Appendix E Table 87: Frequency table showing number of participants who regarded insufficient number of portable devices to be a barrier to the integration of ICT into teacher practice by age.

The frequency table indicates that participants in the subject areas of Vocational Specific subjects considered insufficient number of portable devices a greater barrier to the integration of ICT into classroom practice, reporting higher levels of either "partially" or "a lot", than other participants. No significant effects in respect of teaching experience perceived that insufficient number of portable devices adversely affecting ICT integration into their teaching practice. The results are shown in Table 88 below.

Subject Area	Not at all	A little	Partially	A lot
Academic	9	17	23	11
Engineering	8	7	8	8
Vocational Specific	8	15	28	21
Higher Ed.	1	4	6	4
Vocational Related	4	3	3	4
Computing & Design	12	4	6	3
Student Support	6	3	1	3

Appendix E Table 88: Frequency table showing number of participants who perceived insufficient number of portable devices to be a barrier to the integration of ICT into teacher practice by subject area.

Integration of ICT is adversely affected by the lack of pedagogical models.

A one-way between subjects' ANOVA was conducted to compare means exploring whether there is a statistically significant difference in the mean values of the number of respondents who regarded lack of pedagogical models as having an adverse effect on the integration of ICT into teaching practice by Location, Age, Gender, Subject Area and Teaching Experience.

There was a significant effect of age on ICT integration in regard to "lack of pedagogical models" affecting the integration of ICT in teaching practice at the $p<.05$ level [F(3,223=4.101, p=0.007]. The results presented in Table 89 together with the values in Table 90 suggest that older participants perceive lack of pedagogical models to possibly having an adverse effect on ICT integration.

No significant effects were shown in regard to a participant's location, gender or subject specialisation in whether they regarded lack of pedagogical models as adversely affecting ICT integration into their teaching practice. The results are shown in Table 89 below.

Condition	**Results**
Location (n=226)	[*F*(3,223)=.446, *p*=.720]
Age (n-226)	[*F*(3,223)=4.101, *p*=.007]
Gender (n=211)	[*F*(3,208)=1.445, *p*=.231]
Subject Area (n=226)	[*F*(3,223)=.533, *p*=.660]
Teaching Experience (n=225)	[*F*(3,222)=1.833, *p*=.142]

Appendix E Table 89: Lack of pedagogical models is perceived to be a barrier to ICT integration into teacher practice by Location, Age, Gender, Subject Area and Teaching Experience.

The frequency table indicates that the younger age group indicated that a "lack of pedagogical models" was less of a barrier whereby the two oldest group reported “lack of pedagogical models to be more of a barrier. Location, gender, subject area or teaching experience were not shown to have a statistically significant influence on whether lack of pedagogical models was regarded as having an adverse effect on their teaching practice. The results are shown in Table 90 below.

Age Years	Not at all	A little	Partially	A lot
=<29	15	11	1	1
30 – 30	21	26	8	3
40 – 49	28	26	12	4
=50	22	22	19	8

Appendix E Table 90: Frequency table showing number of participants who regarded lack of pedagogical models to be a barrier to the integration of ICT into teacher practice by age.

Integration of ICT is adversely affected by pressure to prepare students for assessments.

A one-way between subjects’ ANOVA was conducted to compare means exploring whether there is a statistically significant difference in the mean values of the number of respondents who regarded "pressure to prepare students for assessments" as having an adverse effect on the integration of ICT into teaching practice by Location, Age, Gender, Subject Area and Teaching Experience.

There was a significant effect of subject area on ICT integration in regard to "pressure to prepare students for assessments" affecting the integration of ICT in teaching practice at the

p<.05 level [F(3,221=3.286 p=0.022]. The results presented in Table 91 together with the values in Table 92 suggest that teachers in academic subject areas perceive pressure to prepare students for examinations and assessments as possibly having an adverse effect on ICT integration.

No significant effects were shown in regard to a participant's location, age or gender in whether they regarded pressure to prepare students for assessment as adversely affecting ICT integration into their teaching practice. The results are shown in Table 91 below.

Condition	**Results**
Location (n=222)	[F(3,219)=.779, p=.507]
Age (n-222)	[F(3,219)=1.275, p=.284]
Gender (n=207)	[F(3,204)=.987, p=.400]
Subject Area (n=222)	[F(3,201)=3.286, p=.022]
Teacher Experience (n=221)	[F(3,218)=.918, p=.433]

Appendix E Table 91: Pressure to prepare students for examinations is perceived to be a barrier to ICT integration into teacher practice by Location, Age, Gender, Subject Area and Teaching Experience.

The frequency table indicates that academic subject teachers perceived that "pressure to prepare students for assessments" was affecting ICT integration more adversely than other subject areas. Other subject areas were not shown to have a statistically significant influence on whether pressure to prepare students for assessments was regarded as having an adverse effect on ICT integration. The results are shown in Table 92 below.

Subject Area	Not at all	A little	Partially	A lot
Academic	18	10	18	13
Engineering	8	9	7	5
Vocational Specific	27	24	16	4
Higher Ed.	8	6		1
Vocational Related	6	3	2	1
Computing & Design	12	3	7	2
Student Support	6	5	1	1

Appendix E Table 92: Frequency table showing number of participants who regarded pressure to prepare students for assessments to be a barrier to the integration of ICT into teacher practice by subject area.

Summary table of statistical significance results regarding previously identified barriers to ICT integration.

The summary table below (Table 93) displays the results of the one-way between subjects' ANOVA tests conducted to compare means exploring whether there is a statistically significant difference in the means values of Location, Age, Gender, Subject Area and Teaching Experience for factors that have been identified from previous research as being barriers that affect the integration of ICT into teaching practices. The results indicate that of the eleven results showing statistical significance, three results showed the independent variable was location, three results showed the independent variable as age, two was gender and three were within subject areas with the independent variable producing the significant result.

	Independent Variable showing statistical significance at the *p*=<.05 level				
Condition	Location	Age	Gender	Subject Area	Teaching Experienc e
Insufficient number of computers		[*F*(3,225)=3. 456, *p*=.017]			
Insufficient bandwidth	[*F*(3,225)=3.57 9, *p*=.015]			[*F*(3,225)=4.0 23, *p*=.008]	
Insufficient number of Whiteboards	[*F*(3,223)=4.92 3, *p*=.002]				
Insufficient portable devices	[*F*(3.223)=2.86 9, *p*=.037	[*F* (3, 223) = 2.979, *p*=0.034].	[*F*(3,209)=3.11 4, *p*=.027	[*F* (3,223) = 3.003, *p*=0.031].	
Lack of adequate content			[*F* (3,206 = 3.477, p=0.017]		
Lack of pedagogical models		[*F* (3,223 = 4.101, *p*=0.007]			
Pressure to prepare students for examinations"				[*F* (3,221 = 3.286, *p*=0.022]	

Appendix E Table 93: Summary of perceived barriers to integration of ICT into classroom practices.

Teacher participation in technology related Continued Professional Development (CPD) courses:

Introduction

A number of one-way between subjects' ANOVA were conducted to compare means to exploring whether there is a statistically significant difference in the means values of Age, Subject Area and Teaching Experience on the participation of teachers in ten identified Continued Professional Development Courses, (CPD) related to the use and application of Information Communication Technology, (ICT).

Participation in introductory ICT course.

A one-way between subjects' ANOVA was conducted to compare means exploring whether there is a statistically significant difference in the means values of Age, Subject Area and Teaching Experience regarding participation in "introductory courses on internet use and general applications such as word processing, spreadsheets, presentations etc."

There was a significant effect of age shown at the $p<.05$ level [$F(1,227)= 24.473$, $p=<.001$], subject area shown at the p<.05 level [$F(1,227)= 4.577$, $p=.033$] and teaching experience shown at the $p<.05$ level [$F(1,226)=8.489$, $p=.004$] on participation in "Introductory courses on computer and internet use with general applications such as word processing, spreadsheets, presentations etc." .

The results presented in Table 94 together with the values in Table 95 and Table 96 suggest that younger and the less experienced the participants the less likely they were to take part in introductory level courses than were older participants. The results are shown in Table 94 below.

Condition	Results
Location (n=228)	[$F(1,227)=.599$, $p=.440$]
Age (n-228)	[$F(1,227)=24.473$, $p=<.001$]
Gender (n=213)	[$F(1,212)=.705$, $p=.402$]
Subject Area (n=228)	[$F(1,227)=4.577$, $p=.033$]
Teaching Experience (n=228)	[$F(1,226)=8.489$, $p=.004$]

Appendix E Table 94: Participation in CPD courses in Introduction to computers and internet by Location, Age, Gender, Subject Area and Teaching Experience.

The frequency table indicates that more participants attended an introductory course on using the internet and computer applications as the age groups increased. The older the participant, the more likely they were to have taken an introductory course on using the internet and computer applications. Location or teaching specialisation were not shown to have a statistically significant influence on whether or not they had taken such courses. The results are shown in Table 95 below.

Age Years	Yes	No
=<29	8	20
30 – 30	26	34
40 – 49	45	25
=>50	52	19

Appendix E Table 95: Frequency table showing number of participants who attended CPD courses in introduction to computer and internet use by age.

The frequency table indicates that participants within the Academic, Engineering and Vocational Specific subject areas were more likely to participate in introductory level computer use training than other subject areas where the participants were predominantly even split between taking part and not undertaking the introductory training course. The results are shown in Table 96 below.

Subject Area	Yes	No
Academic	39	21
Engineering	20	11
Vocational Specific	40	32
Higher Ed.	8	7
Vocational Related	6	6
Computing & Design	13	13
Student Support	5	8

Appendix E Table 96: Frequency table showing number of participants who attended CPD courses in introduction to computer and internet use by subject area.

The frequency table indicates that participants with 3 years or less experience were equally likely to participate in introductory training courses in computer and internet use than they were to not participate. Teachers with mid-range experience of between 4 – 10 years were more likely to not participate in this type of course, participants with 11 or more years of experience were more likely to attend the introductory courses. The results are shown in Table 97 below.

Teaching Experience Years	Yes	No
=<1	5	5
1 - 3	17	16
4 – 10	40	48
11 – 20	47	23
=>21	21	6

Appendix E Table 97: Frequency table showing number of participants who attended CPD courses in introduction to computer and internet use by teaching experience.

Participation in equipment specific courses:

A one-way between subjects' ANOVA was conducted to compare means exploring whether there is a statistically significant difference in the means values of Location, Age, Gender, Subject Area and Teaching Experience regarding participation on "equipment specific training courses".

There was a significant effect of teaching experience shown at the p=<.05 level [F(1,224) =19.264, p=<.001] on participation in "equipment specific training courses".

The results presented in table 98 together with the values in table 99 suggest the years of teaching experience of the participant may in some way influence how likely they are to undertake training courses in the use of specific digital technology. No significant effects shown in regard to age, gender or subject specialisation influencing whether participants had taken such courses. The results are shown in Table 98 below.

Condition	**Results**
Location (n=226)	[F(1,225)=18.432, p=<.001]
Age (n-226)	[F(1,225)=1.771, p=.185]
Gender (n=211)	[F(1,210)=.584, p=.446]
Subject Area (n=226)	[F(1,225)=1.678, p=.197]
Teaching Experience (n=225)	[F(1,224) =19.264, p=<.001]

Appendix E Table 98: Participation in CPD courses in equipment specific use by Location, Age, Gender, Subject Area and Teaching Experience.

The frequency table indicates that participants with 3 years of teaching experience or less were more likely to not participate in equipment specific training courses. Participants with 4 years or more teaching experience were more likely to participate than not participate in equipment specific training courses. Age, gender or teaching specialisation were not shown to have a statistically significant influence on whether or not they had taken such courses. The results are shown in Table 99 below.

Teaching Experience Years	Yes	No
=<1	2	8
1 - 3	17	16
4 – 10	47	39
11 – 20	59	11
=>21	19	8

Appendix E Table 99: Frequency table showing number of participants who attended CPD courses in equipment specific training by teaching experience.

Participation in subject specific training on learning applications:

A one-way between subjects' ANOVA was conducted to compare means exploring whether there is a statistically significant difference in the means values of Location, Age, Gender, Subject Area and Teaching Experience regarding participation on courses in "Subject specific training on learning applications ".

There was a significant effect of age shown at the p=<.05 level [F(1,226) = 4.013, p=0.046] and teaching experience shown at the p<.05 level [F(1,225) =4.411, p=.037] on participation in "subject specific training courses".

The results presented in table 100 together with the values in table 101 and table 102 suggest that the age and the teaching experience of the participant may in some way influence how likely they are to undertake training courses in subject specific digital technology. No significant effects shown in regard to subject specialisation influencing whether participants had taken such courses. The results are shown in Table 100 below.

Condition	Results
Location (n=227)	[F(1,226)=1.636, p=.202]
Age (n-227)	[F(1,226)=4.013, p=.046]
Gender (n=212)	[F(1,211)=.275, p=.600]
Subject Area (n=227)	[F(1,226)=.013, p=.910]
Teaching Experience (n=226)	[F(1,225)=4.411, p=.037]

Appendix E Table 100: Participation in CPD courses in subject specific training on learning apps. by Location, Age, Gender, Subject Area and Teaching Experience

The frequency table indicates that participants age 29 or younger were more likely to not attend subject specific ICT training courses. Participants from the 30 – 39 years age group were almost equally split between participation and non-participation, while participants aged 40 years and over were more likely to attend subject specific courses using ICT. Location, gender or teaching specialisation were not shown to have a statistically significant influence on whether or not they had taken such courses. The results are shown in Table 101 below.

Age Years	Yes	No
=<29	11	17
30 – 39	30	29
40 – 49	47	23
=>50	42	29

Appendix E Table 101: Frequency table showing number of participants who attended CPD courses on subject specific training by age.

The frequency table indicates that participants with 10 years teaching experience or less were almost equally split between participation and non-participation in subject specific using ICT training courses. Participants with 11 years or more of teaching experience were more likely to participate than not participate in subject specific training courses using ICT. The results are shown in Table 102 below.

Teaching Experience Years	Yes	No
=<1	4	6
1 - 3	17	16
4 – 10	44	43
11 – 20	47	23

Appendix E Table 102: Frequency table showing number of participants who attended CPD courses on subject specific training by teaching experience.

Participation in courses on multi-media:

A one-way between subjects' ANOVA was conducted to compare means exploring whether there is a statistically significant difference in the means values of Location, Age, Gender, Subject Area and Teaching Experience regarding participation on "multi-media courses". There was a significant effect of teaching experience on participation in "multi-media courses", at the $p<.05$ level [$F(1,223) = 4.205$, $p=0.041$]

The results presented in table 103 together with the values in table 104 suggest that the teaching experience of the participant may in some way influence how likely they are to undertake training courses in multi-media. No significant effects shown in regard to location, gender or subject specialisation influencing whether participants had taken such courses. The results are shown in Table 103 below.

Condition	**Results**
Location (n=225)	[$F(1,224)=1.316$, $p=.252$]
Age (n-225)	[$F(1,224)=.067$, $p=.795$]
Gender (n=211)	[$F(1,210)=.253$, $p=.616$]
Subject Area (n=225)	[$F(1,224)=.003$, $p=.954$]
Teaching Experience (n=224)	[$F(1,223)=4.205$, $p=.041$]

Appendix E Table 103: Participation in CPD courses in multi-media by Location, Age, Gender, Subject Area and Teaching Experience

The frequency table indicates that participants in all age were more likely to not participate in multi-media training courses participants with more than 11 years teaching experience would be more likely to attend than other groups. The results are shown in Table 104 below.

Teaching Experience Years	Yes	No
=<1	1	9
1 - 3	11	22
4 – 10	31	56
11 – 20	30	38
=>21	12	15

Appendix E Table 104: Frequency table showing number of participants who attended CPD courses on multi-media by teaching experience.

Participation in In-house training courses on ICT integration:

A one-way between subjects' ANOVA was conducted to compare means exploring whether there is a statistically significant difference in the means values of Location, Age, Gender, Subject Area and Teaching Experience regarding participation in "In-house training".

There was a significant effect of age shown at the p=<.05 level [F(1,221) = 5.545, p=0.019] and teaching experience shown at the p<.05 level [F(1,220) =11.874, p.001] on participation in "In-house training".

The results presented in Table 105 together with the values in Table 106 and Table 107 suggest that younger participants were less likely to take part in courses provided on an in-house basis than the older participants. No significant effects shown that subject specialisation influenced whether participants and taken such courses. The results are shown in Table 105 below.

Condition	**Results**
Location (n=222)	[F(1,221)=2.538, p=.113]
Age (n-222)	[F(1,221)=5.545, p=.019]
Gender (n=208)	[F(1,208)=1.620, p=.204]
Subject Area (n=222)	[F(1,221)=.062, p=.804]
Teaching Experience (n=221)	[F(1,221)=11.874, p=.001]

Appendix E Table 105: Participation in CPD courses through In-House training by Location, Age, Gender, Subject Area and Teaching Experience.

The frequency table indicates that participants in the age groups 39 years and younger were more likely to not participate in "In-house training courses" than to participate. The participants aged 40 years and older were more likely to participate in in-house training than not participate. The results are shown in Table 106 below.

Age Years	Yes	No
=<29	11	17
30 – 39	28	31
40 – 49	35	33
=>50	43	25

Appendix E Table 106: Frequency table showing number of participants who attended CPD courses through In-House training by age.

The frequency table indicates that participants with 3 years teaching experience are more likely to not participate in in-house training courses, participants with between 4 – 10 years teaching experience are equally split between participation and non-participation. Participants with 11 years or more a more likely to participate in in-house training courses, a participant's gender, location or teaching specialisation were not shown to have a statistically significant influence on whether or not they had taken such courses. The results are shown in Table 107 below.

Teaching Experience Years	Yes	No
=<1	4	6
1 - 3	10	23
4 – 10	43	43
11 – 20	42	25
=>21	18	8

Appendix E Table 107: Frequency table showing number of participants who attended CPD courses through In-House training by teaching experience.

Participation in externally provided ICT CPD courses:

A one-way between subjects' ANOVA was conducted to compare means exploring whether there is a statistically significant difference in the means values of Location, Age, Gender, Subject Area and Teaching Experience regarding participation in "CPD training provided from sources other than in-house training".

There was a significant effect of age shown at the p=<.05 level [F(1,224) = 7.734, p=0.006] and teaching experience shown at the p<.05 level [F(1,223) =16.336, p=<.001] on participation in "CPD training provided from sources other than in-house training".

The results presented in Table 108 together with the values in Table 109 and Table 110 suggest that older participants were more likely to take part in CPD training provided from a source other than in-house training. No significant effects shown in regard to subject specialisations influencing whether participants had taken such courses. The results are shown in Table 108 below.

Condition	**Results**
Location (n=225)	[$F(1,224)=1.103$, $p=.293$]
Age (n-225)	[$F(1,224)=7.734$, $p=.006$]
Gender (n=210)	[$F(1,209)=1.484$, $p=.225$]
Subject Area (n=225)	[$F(1,224)=.411$, $p=.522$]
Teaching Experience (n=224)	[$F(1,223)=16.336$, $p=<.001$]

Appendix E Table 108: Participation in CPD courses provided from sources other than though In-House training by Location, Age, Gender, Subject Area and Teaching Experience.

The frequency table indicates that participants in all age groups are more likely to take part in training courses provided from sources other than in-house, the 50 years and over age group are much more likely to participate than not participate in "CPD training provided from sources other than In-house training courses". Location, gender or teaching specialisation were not shown to have a statistically significant influence on whether or not they had taken such courses. The results are shown in Table 109 below.

Age Years	Yes	No
=<29	15	12
30 – 30	31	28
40 – 49	37	33
=>50	55	15

Appendix E Table 109: Frequency table showing number of participants who attended CPD courses provided from sources other than through In-House training by age.

The frequency table indicates that participants with less than 3 years of experience are more likely not to attend CPD courses provided from sources other than through In-House training while participants with 4 or more years teaching experience are more likely to attend these training courses. Gender, location or teaching specialisation were not shown to have a statistically significant influence on whether or not they had taken such courses. The results are shown in Table 110 below.

Teaching Experience Years	Yes	No
=<1	5	5
1 - 3	15	18
4 – 10	46	40
11 – 20	48	22
=>21	24	2

Appendix E Table 110: Frequency table showing number of participants who attended CPD courses provided from sources other than through In-House training by teaching experience.

Summary table of statistical significance results regarding teacher participation in CPD Courses by Location, Age, Gender, Subject Area and Teaching Experience:

The summary table below (Table 111) displays the results of the one-way between subjects' ANOVA tests conducted to compare means exploring whether there is a statistically significant difference in the means values of Location, Age, Gender, Subject Area and Teaching Experience for the 10 Continued Professional Courses identified. The results indicate that of the eleven results showing statistical significance, six results indicated that the independent variable Teaching Experience indicated a significant result, four of these results indicated that the independent variable was age, the other result was with independent variable location producing the significant result.

	Independent Variable showing statistical significance at the p=.05 level				
Condition	Location	Age	Gender	Subject Area	Teaching Experience
Introductory courses on internet use and general applications		[F (1,227) = 24.473, p=<.001]			[F(1,226)=8.489,p =.004]
Equipment specific training	F (1,206) = 23.053, p=.001]				[F (1,224) =19.264, p=<.001]
Subject specific courses		[F (1,226) = 4.013, p=.046]			[F (1,225) =4.411, p=.037]
Multi-media courses					[F (1,223) = 4.205, p=.041]
In-house training		[F (1,221) = 5.545, p=.019]			[F (1,220) =11.874, p=.001]
CPD training provided from sources other than in-house training		[F (1,224) = 7.734, p=.006]			[F (1,223) =16.336, p=<.001]

Appendix E Table 111: Summary of test showing statistical significance for participation in CPD courses.

Tables of results showing no statistical significance and therefore not included in results chapter

Teacher self-efficacy in general tasks incorporating technology.

Introduction.

A number of one-way between subjects' ANOVA was conducted to compare means to exploring whether there is a statistically significant difference in the means values of Location, Age, Gender, Subject Area and Teaching Experience on investigate teacher self-efficacy in a number of general tasks incorporating ICT

Confidence using a word processing programme.

A one-way between subjects' ANOVA was conducted to compare means exploring whether there is a statistically significant difference in the means values of the number of respondents "confident in using a word processing programme" by Location, Age, Gender, Subject Area and Teaching Experiences.

No statistically significant values were returned for any conditions (see table 112).

Condition	Results
Location (n=226)	[$F(3,223)=1.278$, $p=.283$]
Age (n-226)	[$F(3,223)=.653$, $p=.582$]
Gender (n=211)	[$F(3,208)=.684$, $p=.563$]
Subject Area (n=226)	[$F(3,223)=.235$, $p=.872$]
Teaching Experience (n=225)	[$F(3,223)=.910$, $p=.437$]

Appendix E Table 112: Teacher self-efficacy in use of word processing programme by Location, Age, Gender, Subject Area and Teaching Experience.

Confidence using email.

A one-way between subjects' ANOVA was conducted to compare means exploring whether there is a statistically significant difference in the means values of the number of respondents "confident using email" by Location, Age, Gender, Subject Area and Teaching Experiences.

No statistically significant values were returned for any conditions (see table 113).

Condition	Results
Location (n=227)	[*F*(3,224)=.172, *p*=.915]
Age (n-227)	[*F*(3,224)=.024, *p*=.995]
Gender (n=212)	[*F*(3,209)=1.348, *p*=.260]
Subject Area (n=227)	[*F*(3,224)=1.854, *p*=.138]
Teaching Experience (n=226)	[*F*(3,223)=.469, *p*=.704]

Appendix E Table 113: Teacher self-efficacy in using email by Location, Age, Gender, Subject Area and Teaching Experience.

Confident capturing and editing digital photos and images.

A one-way between subjects' ANOVA was conducted to compare means exploring whether there is a statistically significant difference in the means values of the number of respondents "confident in capturing and editing digital photos and images" by Location, Age, Gender, Subject Area and Teaching Experiences.

No statistically significant values were returned for any conditions (see table 114).

Condition	Results
Location (n=227)	[*F*(3,224)=1.511, *p*=.213]
Age (n-227)	[*F*(3,224)=1.542, *p*=.205]
Gender (n=212)	[*F*(3,209)=2.528, *p*=.058]
Subject Area (n=227)	[*F*(3,224)=1.430 *p*=.235]
Teaching Experience (n=226)	[*F*(3,223)=.858, *p*=.464]

Appendix E Table 114: Teacher self-efficacy in capturing and editing digital photos and images by Location, Age, Gender, Subject Area and Teaching Experience.

Confidence editing text online containing hyperlinks and images.

A one-way between subjects' ANOVA was conducted to compare means exploring whether there is a statistically significant difference in the means values of the number of respondents "confident editing text online containing hyperlinks and images" by Location, Age, Gender, Subject Area and Teaching Experiences.

No statistically significant values were returned for any conditions (see table 115).

Condition	Results
Location (n=226)	[F(3,223)=1.240, p=.296]
Age (n-226)	[F(3,223)=1.247, p=.294]
Gender (n=211)	[F(3,208)=.691, p=.558]
Subject Area (n=226)	[F(3,223)=1.127, p=.339]

Appendix E Table 115: Teacher self-efficacy in editing text online containing hyperlinks and images by Location, Age, Gender, Subject Area and Teaching Experience.

Confidence in organising computer files and folders.

A one-way between subjects' ANOVA was conducted to compare means exploring whether there is a statistically significant difference in the means values of the number of respondents confident in organising computer files and folders" by Location, Age, Gender, Subject Area and Teaching Experiences.

No statistically significant values were returned for any conditions (see table 116).

Condition	Results
Location (n=226)	[F(2,224)=.221, p=.802]
Age (n-226)	[F(2,224)=2.911, p=.056]
Gender (n=211)	[F(2,209)=.468, p=.627]
Subject Area (n=226)	[F(2,224)=.586, p=.558]

Appendix E Table 116: Teacher self-efficacy in organising computer files and folders by Location, Age, Gender, Subject Area and Teaching Experience.

Confidence in using a spreadsheet.

A one-way between subjects' ANOVA was conducted to compare means exploring whether there is a statistically significant difference in the means values of the number of respondents "confident in using a spreadsheet programme" by Location, Age, Gender, Subject Area and Teaching Experiences.

No statistically significant values were returned for any conditions (see table 117).

Condition	Results
Location (n=227)	[$F(3,224)=1.354$, $p=.258$]
Age (n-227)	[$F(3,224)=2.072$, $p=.105$]
Gender (n=212)	[$F(3,209)=1.341$, $p=.262$]
Subject Area (n=227)	[$F(3,224)=1.061$, $p=.366$]
Teaching Experience (n=226)	[$F(3,223)=.211$, $p=.889$]

Appendix E Table 117: Teacher self-efficacy in using a spreadsheet programme by Location, Age, Gender, Subject Area and Teaching Experience.

Confidence using a spreadsheet to plot a graph.

A one-way between subjects' ANOVA was conducted to compare means exploring whether there is a statistically significant difference in the means values of the number of respondents "confident using a spreadsheet to plot a graph" by Location, Age, Gender, Subject Area and Teaching Experiences.

No statistically significant values were returned for any conditions (see table 118).

Condition	Results
Location (n=225)	[$F(3,222)=.580$, $p=.629$]
Age (n-225)	[$F(3,222)=1.111$, $p=.346$]
Gender (n=210)	[$F(3,207)=1.954$, $p=.122$]
Subject Area (n=225)	[$F(3,222)=1.531$, $p=.207$]

Appendix E Table 118: Teacher self-efficacy in using a spreadsheet to plot a graph by Location, Age, Gender, Subject Area and Teaching Experience.

Frequency and type of teacher engagement with Information Communication Technology (ICT) in their teaching practice.

Introduction.

A number of one-way between subjects' ANOVA was conducted to compare means to exploring whether there is a statistically significant difference in the means values of Location, Age, Gender, Subject Area and Teaching Experience on the frequency of use and type of engagement with ICT in their teaching and classroom practice.

Using ICT to browse or search the internet for resources to prepare lessons.

A one-way between subjects' ANOVA was conducted to compare means exploring whether there is a statistically significant difference in the means values of the number of respondents who "use ICT to collect resources for lesson preparations" by Location, Age, Gender, Subject Area and Teaching Experiences.

No statistically significant values were returned for any conditions (see table 119).

Condition	**Results**
Location (n=227)	[F(3,224)=.539, p=.656]
Age (n-227)	[F(3,224)=2.151, p=.095]
Gender (n=212)	[F(3,209)=.727, p=.537]
Subject Area (n=227)	[F(3,224)=.555, p=.645]

Appendix E Table 119: Teacher engagement with ICT to collect resources for lesson preparation by Location, Age, Gender, Subject Area and Teaching Experience.

Using ICT applications to prepare presentations.

A one-way between subjects' ANOVA was conducted to compare means exploring whether there is a statistically significant difference in the means values of the number of respondents who engaged in "using applications to prepare presentations" by Location, Age, Gender, Subject Area and Teaching Experiences.

No statistically significant values were returned for any conditions (see table 120).

25	Results
Location (n=225)	[$F(3,222)=.653$, $p=.582$]
Age (n-225)	[$F(3,222)=.793$, $p=.499$]
Gender (n=210)	[$F(3,207)=.147$, $p=932$]
Subject Area (n=225)	[$F(3,222)=2.064$, $p=.103$]
Teaching Experience (n=224)	[$F(3,221)=.058$, $p=.982$]

Appendix E Table 120: Teacher engagement with ICT using apps to prepare presentations by Location, Age, Gender, Subject Area and Teaching Experience.

Using ICT to provide student feedback.

A one-way between subjects' ANOVA was conducted to compare means exploring whether there is a statistically significant difference in the means values of the number of respondents "using ICT to provide student feedback" by Location, Age, Gender, Subject Area and Teaching Experiences.

No statistically significant values were returned for any conditions (see table 121).

Condition	Results
Location (n=228)	[$F(3,225)=.001$, $p=1.000$]
Age (n-228)	[$F(3,225)=1.764$, $p=.155$]
Gender (n=213)	[$F(3,210)=1.657$, $p=.177$]
Subject Area (n=228)	[$F(3,225)=.903$, $p=.440$]
Teaching Experience (n=227)	[$F(3,224)=.340$, $p=.796$]

Appendix E Table 121: Teacher use of ICT to provide student feedback by Location, Age, Gender, Subject Area and Teaching Experience.

Using ICT to evaluate other digital learning resources.

A one-way between subjects' ANOVA was conducted to compare means exploring whether there is a statistically significant difference in the means values of the number of respondents "using ICT to evaluate other digital learning resources" by Location, Age, Gender, Subject Area and Teaching Experiences.

No statistically significant values were returned for any conditions (see table 122).

Condition	Results
Location (n=227)	[F(3,224)=.840, p=.473]
Age (n-227)	[F(3,224)=.301, p=.825]
Gender (n=212)	[F(3,209)=1.799, p=.148]
Subject Area (n=227)	[F(3,224)=2.260, p=.082]
Teaching Experience (n=226)	[F(3,223)=1.144, p=.332]

Appendix E Table 122: Teacher using ICT to evaluate other digital learning resources by Location, Age, Gender, Subject Area and Teaching Experience.

Using ICT to download material from the college website.

A one-way between subjects' ANOVA was conducted to compare means exploring whether there is a statistically significant difference in the means values of the number of respondents who "downloaded material from the college website" by Location, Age, Gender, Subject Area and Teaching Experiences.

No statistically significant values were returned for any conditions (see table 123).

Condition	Results
Location (n=226)	[F(3,223)=.445, p=.721]
Age (n-226)	[F(3,223)=1.634, p=.182]
Gender (n=211)	[F(3,208)=.803, p=.493]
Subject Area (n=226)	[F(3,223)=.858, p=.464]
Teaching Experience (n=224)	[F(3,221)=1.370, p=.253]

Appendix E Table 123: Teacher engagement with ICT to download material from the college website by Location, Age, Gender, Subject Area and Teaching Experience.

Using ICT to gather material from a virtual learning environment (VLE).

A one-way between subjects' ANOVA was conducted to compare means exploring whether there is a statistically significant difference in the means values of the number of respondents who "use material from a virtual learning environment (VLE)" by Location, Age, Gender, Subject Area and Teaching Experiences.

No statistically significant values were returned for any conditions (see table 124).

Condition	Results
Location (n=224)	[$F(3,221)=.369$, $p=.775$]
Age (n-224)	[$F(3,221)=1.043$, $p=.374$]
Gender (n=209)	[$F(3,206)=.772$, $p=.511$]
Subject Area (n=224)	[$F(3,221)=.311$, $p=.818$]
Teaching Experience (n=223)	[$F(3,220)=.760$, $p=.518$]

Appendix E Table 124: Teacher engagement with ICT to download material from a VLE by Location, Age, Gender, Subject Area and Teaching Experience.

Using ICT to browse or search the internet to research CPD opportunities.

A one-way between subjects' ANOVA was conducted to compare means exploring whether there is a statistically significant difference in the means values of the number of participants who "use ICT to research CPD opportunities" by Location, Age, Gender, Subject Area and Teaching Experiences.

No statistically significant values were returned for any conditions (see table 125).

Condition	Results
Location (n=226)	[$F(3,223)=.927$, $p=.429$]
Age (n-226)	[$F(3,223)=.375$, $p=.771$]
Gender (n=211)	[$F(3,208)=.693$, $p=.557$]
Subject Area (n=226)	[$F(3,223)=1.536$, $p=.206$]
Teaching Experience (n=225)	[$F(3,222)=.300$, $p=.825$]

Appendix E Table 125: Teacher engagement with ICT to research possible CPD opportunities by Location, Age, Gender, Subject Area and Teaching Experience.

Types of ICT resources used in classroom delivery or teaching.

Introduction.

A number of one-way between subjects' ANOVA was conducted to compare means to exploring whether there is a statistically significant difference in the means values of Location, Age, Gender, Subject Area and Teaching Experience on the types and source of ICT resources used in classroom delivery or teaching.

Using resources sources from the internet in classroom delivery and teaching.

A one-way between subjects' ANOVA was conducted to compare means exploring whether there is a statistically significant difference in the means values of the number of respondents who use "resources collected from the internet in classroom delivery" by Location, Age, Gender, Subject Area and Teaching Experiences.

No statistically significant values were returned for any conditions (see table 126).

Condition	**Results**
Location (n=227)	[F(1,226)=.318, p=.573]
Age (n-227)	[F(1,226)=2.110, p=.740]
Gender (n=212)	[F(1,211)=1.056, p=.305]
Subject Area (n=227)	[F(1,226)=.321, p=.572]
Teaching Experience (n=226)	[F(1,226)=.236, p=.628]

Appendix E Table 126: Teacher use of resources collected from the internet in classroom delivery and teaching by Location, Age, Gender, Subject Area and Teaching Experience.

Using off-line electronic resources in classroom delivery and teaching.

A one-way between subjects' ANOVA was conducted to compare means exploring whether there is a statistically significant difference in the means values of the number of respondents who "use off-line electronic resources" by Location, Age, Gender, Subject Area and Teaching Experiences.

No statistically significant values were returned for any conditions (see table 127).

Condition	Results
Location (n=221)	[F(1,220)=.712, p=.400]
Age (n-221)	[F(1,220)=3.253, p=.073]
Gender (n=206)	[F(1,205)=2.074, p=.151]
Subject Area (n=221)	[F(1,221)=.093, p=.761]
Teaching Experience (n=220)	[F(1,221)=2.555, p=.111]

Appendix E Table 127: Teacher use of off-line electronic resources by Location, Age, Gender, Subject Area and Teaching Experience.

Using materials of their own creation in classroom delivery and teaching.

A one-way between subjects' ANOVA was conducted to compare means exploring whether there is a statistically significant difference in the means values of the number of respondents who "use material of their own creation" by Location, Age, Gender, Subject Area and Teaching Experiences.

No statistically significant values were returned for any conditions (see table 128).

Condition	Results
Location (n=227)	[F(1,226)=.354, p=.553]
Age (n-227)	[F(1,226)=1.706, p=.193]
Gender (n=212)	[F(1,211)=.340, p=.561]
Subject Area (n=227)	[F(1,226)=.025, p=.874]
Teaching Experience (n=226)	[F(1,226)=.721, p=.397]

Appendix E Table 128: Teacher use materials of their own creation by Location, Age, Gender, Subject Area and Teaching Experience.

Using materials from mainstream websites in classroom delivery and teaching.

A one-way between subjects' ANOVA was conducted to compare means exploring whether there is a statistically significant difference in the means values of the number of respondents who "use material from mainstream websites" by Location, Age, Gender, Subject Area and Teaching Experiences.

No statistically significant values were returned for any conditions (see table 129).

Condition	**Results**
Location (n=222)	[F(1,221)=.015, p=.902]
Age (n-222)	[F(1,221)=.701, p=.403]
Gender (n=207)	[F(1,206)=.111, p=.739]
Subject Area (n=222)	[F(1,221)=1.915, p=.168]
Teaching Experience (n=222)	[F(1,221)=1.039, p=.309]

Appendix E Table 129: Teacher use materials from mainstream websites by Location, Age, Gender, Subject Area and Teaching Experience.

Teacher's perceptions regarding potential barriers and factors that could adversely affect the integration of Technology into teaching practice:

Introduction

Results of a number of one-way between subjects' ANOVA conducted to compare the effect of Location, Age, Gender, Subject Area and Teaching Experience on teacher perceptions regarding the potential adverse effect on the integration of ICT into their teaching practice using 18 identified barriers from previous research.

Integration of ICT is adversely affected by insufficient number of internet connected computers:

A one-way between subjects' ANOVA was conducted to compare means exploring whether there is a statistically significant difference in the mean values of the number of respondents who regarded "insufficient numbers of internet connected computers" having an adverse effect on the integration of ICT into their teaching practice by Location, Age, Gender, Subject Area and Teaching Experience.

No statistically significant values were returned for any conditions (see table 130).

Condition	**Results**
Location (n=224)	[F(3,221)=.335, p=.800]
Age (n-224)	[F(3,221)=1.498, p=.216]
Gender (n=209)	[F(3, 206)=1.385, p=.248]
Subject Area (n=224)	[F(3,221)=.909, p=.437]
Teaching Experience (n=223)	[F (3,220)=.834, p=.477]

Appendix E Table 130: Insufficient number of internet connected computers perceived to be a barrier to ICT integration into teacher practice by Location, Age, Gender, Subject Area and Teaching Experience.

Integration of ICT is adversely affected by old or low specification hardware:

A one-way between subjects' ANOVA was conducted to compare means exploring whether there is a statistically significant difference in the mean values of the number of respondents who regarded the "specification of the college hardware and technology" having an adverse effect on the integration of ICT into their teaching practice by Location, Age, Gender, Subject Area and Teaching Experience.

No statistically significant values were returned for any conditions (see table 131).

Condition	Results
Location (n=226)	[*F*(3,223)=.194, *p*=.901]
Age (n-226)	[*F*(3,223)=2.542, *p*=.057]
Gender (n=211)	[*F*(3,208)=.375, *p*=.771]
Subject Area (n=226)	[*F*(3,223)=1.353, *p*=.258]
Teaching Experience (n=225)	[*F* (3,222)=1.243, *p*=.295]

Appendix E Table 131: Low or out-dated specification of Technology and computer hardware is perceived to be a barrier to ICT integration into teacher practice by Location, Age, Gender, Subject Area and Teaching Experience.

Integration of ICT is adversely affected by lack of teacher skills:

A one-way between subjects' ANOVA was conducted to compare means exploring whether there is a statistically significant difference in the mean values of the number of respondents who regarded "lack of teacher skills" as having an adverse effect on to the integration of ICT into their teaching practice by Location, Age, Gender, Subject Area and Teaching Experience.

No statistically significant values were returned for any conditions (see table 132).

Condition	Results
Location (n=225)	[*F*(3,222)=.155, *p*=.926]
Age (n-225)	[*F*(3,222)=.266, *p*=.850]
Gender (n=210)	[*F*(3,207)=1.370, *p*=.253]
Subject Area (n=225)	[*F*(3,222)=1.015, *p*=.387]
Teaching Experience (n=224)	[*F*(3,221)=.150, *p*=.929]

Appendix E Table 132: Lack of teacher skills is perceived to be a barrier to ICT integration into teacher practice by Location, Age, Gender, Subject Area and Teaching Experience.

Integration of ICT is adversely affected by insufficient technical support:

A one-way between subjects' ANOVA was conducted to compare means exploring whether there is a statistically significant difference in the mean values of the number of respondents who regarded "insufficient technical support" as having an adverse effect on the integration of ICT into their teaching practice by Location, Age, Gender, Subject Area and Teaching Experience.

No statistically significant values were returned for any conditions (see table 133).

Condition	Results
Location (n=225)	[*F*(3,222)=.299, *p*=.826]
Age (n-225)	[*F*(3,222)=.340, *p*=.796]
Gender (n=210)	[*F*(3,207)=.707, *p*=.549]
Subject Area (n=225)	[*F*(3,222)=.407, *p*=.748]

Appendix E Table 133: Insufficient technical support is perceived to be a barrier to ICT integration into teacher practice by Location, Age, Gender, Subject Area and Teaching Experience.

Integration of ICT is adversely affected by insufficient pedagogical support:

A one-way between subjects' ANOVA was conducted to compare means exploring whether there is a statistically significant difference in the mean values of the number of respondents who regarded "insufficient pedagogical support" as having an adverse effect on the integration of ICT into their teaching practice by Location, Age, Gender, Subject Area and Teaching Experience.

No statistically significant values were returned for any conditions (see table 134).

Condition	Results
Location (n=224)	[*F*(3,221)=.621, *p*=.602]
Age (n-224)	[*F*(3,221)=2.010, *p*=.113]
Gender (n=209)	[*F*(3,206)=.934, *p*=.425]
Subject Area (n=224)	[*F*(3,221)=.382, *p*=.766]
Teaching Experience (n=223)	[*F*(3,220)=.999, *p*=.394]

Appendix E Table 134: Insufficient pedagogical support is perceived to be a barrier to ICT integration into teacher practice by Location, Age, Gender, Subject Area and Teaching Experience.

Integration of ICT is adversely affected by classroom layout.

A one-way between subjects' ANOVA was conducted to compare means exploring whether there is a statistically significant difference in the mean values of the number of respondents who regarded "classroom layout" as having an adverse effect on the integration of ICT into their teaching practice by Location, Age, Gender, Subject Area and Teaching Experience.

No statistically significant values were returned for any conditions (see table 135).

Condition	Results
Location (n=226)	[*F*(3,223)=1.734, *p*=.161]
Age (n-226)	[*F*(3,223)=.302, *p*=.824]
Gender (n=211)	[*F*(3,208)=1.122, *p*=.341]
Subject Area (n=226)	[*F*(3,223)=2.188, *p*=.090]
Teaching Experience (n=225)	[*F*(3,222)=1.681, *p*=.172

Appendix E Table 135: Classroom layout perceived to be a barrier to ICT integration into teacher practice by Location, Age, Gender, Subject Area and Teaching Experience.

Integration of ICT is adversely affected by teacher resistance.

A one-way between subjects' ANOVA was conducted to compare means exploring whether there is a statistically significant difference in the mean values of the number of respondents who regarded "teacher resistance" as having an adverse effect on the integration of ICT into teaching practice by Location, Age, Gender, Subject Area and Teaching Experience.

No statistically significant values were returned for any conditions (see table 136).

Condition	Results
Location (n=225)	[*F*(3,222)=.917, *p*=.433]
Age (n-225)	[*F*(3,222)=1.348, *p*=.260]
Gender (n=210)	[*F*(3,207)=1.206, *p*=.309]
Subject Area (n=225)	[*F*(3,222)=.745, *p*=.526]
Teacher Experience (n=224)	[*F*(3,221)=.235, *p*=.872]

Appendix E Table 136: Teacher resistance is perceived to be a barrier to ICT integration into teacher practice by Location, Age, Gender, Subject Area and Teaching Experience.

Integration of ICT is adversely affected by lack of teacher interest.

A one-way between subjects' ANOVA was conducted to compare means exploring whether there is a statistically significant difference in the mean values of the number of respondents who regarded "lack of teacher interest" as having an adverse effect on the integration of ICT into teaching practice by Location, Age, Gender, Subject Area and Teaching Experience.

No statistically significant values were returned for any conditions (see table 137).

Condition	Results
Location (n=225)	[*F*(3,222)=1.574, *p*=.196]
Age (n-225)	[*F*(3,222)=1.755, *p*=.157]
Gender (n=210)	[*F*(3,207)=.839, *p*=.474]
Subject Area (n=225)	[*F*(3,222)=1.378, *p*=.250]
Teacher Experience (n=224)	[*F*(3,221)=.826, *p*=.481]

Appendix E Table 137: Lack of teacher interest is perceived to be a barrier to ICT integration into teacher practice by Location, Age, Gender, Subject Area and Teaching Experience.

Integration of ICT is adversely affected by unclear or no benefits.

A one-way between subjects' ANOVA was conducted to compare means exploring whether there is a statistically significant difference in the mean values of the number of respondents who regarded that there are "unclear or no benefits" to the integration as having an adverse effect on the integration of ICT into teaching practice by Location, Age, Gender, Subject Area and Teaching Experience.

No statistically significant values were returned for any conditions (see table 138).

Condition	Results
Location (n=226)	[*F*(3,223)=.358, *p*=.783]
Age (n-226)	[*F*(3,223)=.526, *p*=.665]
Gender (n=211	[*F*(3,208)=.925, *p*=.430]
Subject Area (n=226)	[*F*(3,223=.750, *p*=.523]
Teacher Experience (n=225)	[*F*(3,222)=2.208, *p*=.088]

Appendix E Table 138: No or unclear benefits is perceived to be a barrier to ICT integration into teacher practice by Location, Age, Gender, Subject Area and Teaching Experience.

Integration of ICT is adversely affected by integration not being considered a goal of the college.

A one-way between subjects' ANOVA was conducted to compare means exploring whether there is a statistically significant difference in the mean values of the number of respondents who regarded the "integration of ICT not a goal of the college" being as having an adverse effect on the integration of ICT into teaching practice by Location, Age, Gender, Subject Area and Teaching Experience.

No statistically significant values were returned for any conditions (see table 139).

Condition	Results
Location (n=224)	[*F*(3,221)=2.018, *p*=.112]
Age (n-224)	[*F*(3,221)=.333, *p*=.802]
Gender (n=209)	[*F*(3,189)=1.262, *p*=.288]
Subject Area (n=224)	[*F*(3,203)=.552, *p*=.647]
Teacher Experience (n=223)	[*F*(3,220)=.136, *p*=.938]

Appendix E Table 139: Not regarded as a goal of the college and therefore is perceived to be a barrier to ICT integration into teacher practice by Location, Age, Gender, Subject Area and Teaching Experience.

Teacher participation in technology related Continued Professional Development (CPD) courses that produced results showing no statistical significance:

Introduction

A number of one-way between subjects' ANOVA were conducted to compare means to exploring whether there is a statistically significant difference in the means values of Age, Subject Area and Teaching Experience on the participation of teachers in ten identified Continued Professional Development Courses, (CPD) related to the use and application of Information Communication Technology, (ICT).

Advanced course on internet use:

A one-way between subjects' ANOVA was conducted to compare means exploring whether there is a statistically significant difference in the means values of Location, Age, Gender, Subject Area and Teaching Experience regarding participation on "advanced courses on internet usage".

No statistically significant values were returned for any conditions (see table 140).

Condition	Results
Location (n=227)	[*F*(1,226)=.249, *p*=.618]
Age (n-227)	[*F*(1,226)=.724, *p*=.396]
Gender (n=212)	[*F*(1,211)=.016, *p*=.899]
Subject Area (n=227)	[*F*(1,207)=.535, *p*=.465]
Teaching Experience (n=226)	[*F*(1,225)=1.521, *p*=.219]

Appendix E Table 140: Participation in CPD courses in advanced internet use by Location, Age, Gender, Subject Area and Teaching Experience.

Participation in courses on awareness of ICT pedagogy:

A one-way between subjects' ANOVA was conducted to compare means exploring whether there is a statistically significant difference in the means values of Location, Age, Gender, Subject Area and Teaching Experience regarding participation in "courses on ICT Pedagogy".

No statistically significant values were returned for any conditions (see table 141).

Condition	Results
Location (n=225)	[F(1,225)=1.864, p=.173]
Age (n-225)	[F(1,225)=.017, p=.898]
Gender (n=211)	[F(1,210)=.567, p=.452]
Subject Area (n=225)	[F(1,224)=3.666, p=.057]
Teacher Experience (n=224)	[F(1,223)=2.176,p=.142]

Appendix E Table 141: Participation in CPD courses in ICT pedagogy by Location, Age, Gender, Subject Area and Teaching Experience.

Participation in professional on-line communities:

A one-way between subjects' ANOVA was conducted to compare means exploring whether there is a statistically significant difference in the means values of Location, Age, Gender, Subject Area and Teaching Experience regarding participation in "on-line professional communities".

No statistically significant values were returned for any conditions (see table 142).

Condition	Results
Location (n=224)	[F(1,223)=.107, p=.744]
Age (n-224)	[F(1,223)=.007, p=.932]
Gender (n=211)	[F(1,210)=1.326, p=.251]
Subject Area (n=224)	[F(1,223)=2.662, p=.104]
Teaching Experience (n=223)	[F(1,222)=3.812,p=052]

Appendix E Table 142: Participation in on-line professional communities by Location, Age, Gender, Subject Area and Teaching Experience

Results showing a statistical significance with independent variables of Location and Gender.

Participation in equipment specific courses:

A one-way between subjects' ANOVA was conducted to compare means exploring whether there is a statistically significant difference in the means values of Location, Age, Gender, Subject Area and Teaching Experience regarding participation on "equipment specific training courses".

There was a significant effect of location shown at the $p<.05$ level [$F(1,206) = 23.053$, $p=0.001$] and teaching experience shown at the $p=<.05$ level [$F(1,224) = 19.264$, $p=<.001$] on participation in “equipment specific training courses”.

The frequency table indicates that more participants in the Midlands and Yorkshire regions participated in equipment specific training courses than participants in the North East where participants were equally split between participation and non-participation. Age, gender or teaching specialisation were not shown to have a statistically significant influence on whether or not they had taken such courses. The results are shown in Table 143 below.

Location	Yes	No
North East	53	52
Yorkshire	66	26
Midlands	26	4

Appendix E Table 143: Frequency table showing number of participants who attended CPD courses in equipment specific training by location.

Integration of ICT is adversely affected by insufficient bandwidth:

A one-way between subjects' ANOVA was conducted to compare means exploring whether there is a statistically significant difference in the mean values of the number of respondents who regarded "insufficient bandwidth" and speed having an adverse effect on the integration of ICT into their teaching practice by Location, Age, Gender, Subject Area and Teaching Experience.

There was a significant effect of location indicated shown at the *p*=<.05 level, [*F*(3,225)=3.579, *p*=.015] on insufficient bandwidth affecting the integration of ICT into teaching practice.

The frequency table indicates that participants in the Yorkshire region considered insufficient bandwidth a greater barrier to the integration of ICT in to classroom practice, reporting higher levels of either "partially" or "a lot", than older participants. The results are shown in Table 144 below.

Location	Not at all	A little	Partially	A lot
North East	28	26	34	19
Yorkshire	10	25	20	37
Midlands	3	9	10	8

Appendix E Table 144: Frequency table showing number of participants who perceived insufficient bandwidth to be a barrier to the integration of ICT into teacher practice by location.

Integration of ICT is adversely affected by insufficient number of whiteboards:

A one-way between subjects' ANOVA was conducted to compare means exploring whether there is a statistically significant difference in the mean values of the number of respondents who regarded "insufficient number of whiteboards" having an adverse effect on the integration of ICT into their teaching practice by Location, Age, Gender, Subject Area and Teaching Experience.

There was a significant effect of location indicated shown at the *p*=<.05 level [*F*(3,223)=4.923, *p*=.002] on insufficient number of whiteboards affecting the integration of ICT into teaching practice.

The frequency table indicates that participants in the North East region considered insufficient number of white boards a greater barrier to the integration of ICT in to classroom practice, reporting higher levels of either "partially" or "a lot", than other participants. No significant effects were shown in regard to a participant's age, gender, subject area or teaching experience in whether they regarded insufficient number of whiteboards as adversely affecting ICT integration into their teaching practice. The results are shown in Table 145 below.

Location	Not at all	A little	Partially	A lot
North East	40	16	26	25
Yorkshire	61	14	9	6
Midlands	16	5	7	2

Appendix E Table 145: Frequency table showing number of participants who perceived insufficient number of whiteboards to be a barrier to the integration of ICT into teacher practice by location.

Integration of ICT is adversely affected by insufficient number of portable devices:

A one-way between subjects' ANOVA was conducted to compare means exploring whether there is a statistically significant difference in the mean values of the number of respondents who regarded "insufficient number of portable devices" having adverse effect on the integration of ICT into their teaching practice by Location, Age, Gender, Subject Area and Teaching Experience.

There was a significant effect of location indicated shown at the p=<.05 level [F(3,223)=2.869, p=.037], a significant effect of gender shown at the p=<.05 level [F(3,209)=3.114, p=.027 on "insufficient number of portable devices affecting the integration of ICT into teaching practice.

The frequency table indicates that participants in the North East region considered insufficient number of portable devices a greater barrier to the integration of ICT into classroom practice, reporting higher levels of either "partially" or "a lot", than participants in other regions. The results are shown in Table 146 below.

Location	Not at all	A little	Partially	A lot
North East	18	19	37	33
Yorkshire	23	26	27	14

Appendix E Table 146: Frequency table showing number of participants who perceived insufficient number of portable devices to be a barrier to the integration of ICT into teacher practice by location.

The frequency table indicates that female participants considered insufficient portable devices as possibly having an adverse effect on the integration of ICT in to their teaching practice reporting a more frequent level of either "partially" or "a lot". The results are shown in Table 147 below.

Gender	Not at all	A little	Partially	A lot
Female	15	29	44	27
Male	29	20	28	21

Appendix E Table 147: Frequency table showing number of participants who regarded insufficient number of portable devices to be a barrier to the integration of ICT into teacher practice by gender.

Integration of ICT is adversely affected by lack of suitable content:

A one-way between subjects' ANOVA was conducted to compare means exploring whether there is a statistically significant difference in the mean values of the number of respondents who regarded "lack of adequate content" as having an adverse effect on the integration of ICT into their teaching practice by Location, Age, Gender, Subject Area and Teaching Experience.

There was a significant effect of gender on ICT integration in regard to "lack of adequate content" affecting the integration of ICT in their teaching practice at the $p<.05$ level [$F(3,206)= 3.477$, $p=0.017$]. The results presented in Table 42 together with the values in Table 43 suggest that more male participants perceive lack of adequate content possibly having an adverse effect on ICT integration.

The frequency table indicates that more female participants identified that "lack of adequate content" was considered to be not at all having an adverse effect on the integration of ICT in to classroom practice. The results are shown in Table 148 below.

Gender	Not at all	A little	Partially	A lot
Female	55	39	16	3
Male	29	38	22	8

Appendix E Table 148: Frequency table showing number of participants who regarded lack of adequate content to be a barrier to the integration of ICT into teacher practice by gender.

Using ICT to browse or search the internet for resources to be used during classroom practice.

A one-way between subjects' ANOVA was conducted to compare means exploring whether there is a statistically significant difference in the means values of the number of respondents who "use ICT to collect resources to be used during lesson" by Location, Age, Gender, Subject Area and Teaching Experiences.

There was a significant effect of gender at the $p<.05$ level [$F(3,210)=2.971$, $p=.033$]. The frequency table indicates that female respondents use the internet to source resources for use during lessons to a greater degree. The results are shown in Table 149 below.

Gender	Never Rarely	Sometimes	Often	All the time
Female	1	7	40	67
Male	2	10	36	50

Appendix E Table 149: Frequency table showing number of participants who engage with ICT to collect resources to be used in class teaching by age.

Using resources collected from the college network or database in classroom delivery and teaching.

A one-way between subjects' ANOVA was conducted to compare means exploring whether there is a statistically significant difference in the means values of the number of respondents who use "resources collected from the college network or database in classroom delivery and teaching" by Location, Age, Gender, Subject Area and Teaching Experiences.

There was a significant effect of location on the use of resources collected from the college network or database at the $p<.05$ level [$F(1,222)=5.329$, $p=.022$]. The frequency table indicates that respondents in the Midlands region used resources collected from the college network or database in their classroom delivery and teaching. The results are shown in Table 150 below.

Location	Yes	No
North East	81	25
Yorkshire	77	13
Midlands	26	2

Appendix E Table 150: Frequency table showing number of participants who collect resources from the college network or Database in classroom delivery and teaching by location.

Confidence in creating or maintaining a blog or website.

A one-way between subjects' ANOVA was conducted to compare means exploring whether there is a statistically significant difference in the means values of the number of respondents who are "confident in maintaining a blog or website" by Location, Age, Gender, Subject Area and Teaching Experiences.

There was a significant effect of gender at the p=<.05 level [F(3,208)=2.694, p=.047]. The frequency table indicates that Female participants had most respondents indicating no confidence, but also had more participants that were somewhat confident or a lot confident compared to the male participants. The results are shown in Table 151 below.

Gender	None	A little	Somewhat	A lot
Female	32	23	32	27
Male	22	28	15	33

Appendix E Table 151: Frequency table showing number of participants who have confidence in creating or maintaining a blog or website by gender.

Confidence in participating in a social network.

A one-way between subjects' ANOVA was conducted to compare means exploring whether there is a statistically significant difference in the means values of the number of respondents who are "confident in participating in social network" by Location, Age, Gender, Subject Area and Teaching Experiences.

There was a significant effect of gender at the p=<.05 level [F(3,208)=2.784, p=.042].

The frequency table indicates that while female respondents had more self-efficacy in participating in social networks than did male participants. The results are shown in Table 152 below.

Gender	None	A little	Somewhat	A lot
	4	2	2	7
Female	11	11	18	74
Male	13	21	17	47

Appendix E Table 152: Frequency table showing number of participants who have confidence in participating in social network by gender.

Confidence in downloading computer software.

A one-way between subjects' ANOVA was conducted to compare means exploring whether there is a statistically significant difference in the means values of the number of respondents who are "confident in downloading computer software" by Location, Age, Gender, Subject Area and Teaching Experiences.

There was a significant effect of gender at the p=<.05 level [F(3,208)=2.788, p=.042].

The frequency table indicates that while female respondents had less self-efficacy in downloading software. The results are shown in Table 153 below.

Gender	None	A little	Somewhat	A lot
Female	14	19	22	59
Male	5	8	19	66

Appendix E Table 153: Frequency table showing number of participants who have confidence in downloading software by gender.

Confidence in preparing material for use with interactive white boards.

The frequency table indicates that respondents in the north east had less self-efficacy in being able to prepare materials for use on interactive whiteboards with a higher number of responses showing little or no confidence in this task. Results are shown in Table 154 below.

Location	None	A little	Somewhat	A lot
North East	14	19	30	44
Yorkshire	6	14	20	51
Midlands		4	7	18

Appendix E Table 154: Frequency table showing number of participants who have confidence in preparing materials for interactive whiteboards by location.

Confidence in programming.

A one-way between subjects' ANOVA was conducted to compare means exploring whether there is a statistically significant difference in the means values of the number of respondents who are "confident in programming" by Location, Age, Gender, Subject Area and Teaching Experiences.

There was a significant effect of gender on confidence programming at the p=<.05 level [$F(3,208)=4.180$, $p=.007$. The frequency table indicates that female participants had less self-efficacy in programming with high level of responses showing little or no confidence in this task. The results are shown in Table 155 below.

Gender	None	A little	Somewhat	A lot
Female	80	20	6	8
Male	49	20	9	20

Appendix E Table 155: Frequency table showing number of participants who have confidence in programming by gender.

Appendix F.
Phase 2 Survey.

Phase 2 Questionnaire

Page 1

You are invited to take part in phase two of the research study in which I will be asking you to provide details about your background from an educational and career perspective. This is to enable me to build a more substantial profile of teachers and tutors working in Vocational Education.

Please read this notice fully and email me or my supervisors (contact details below) if you have any questions before clicking "Next". By clicking "Next" you are agreeing to be part of the study and giving permission for the information you provide to be used in the ways described below.

The study is part of Robert Shedden's Doctorate in Education with the University of Durham.

* This research project is supervised by Dr Julie Rattray & Dr. Andrew Joyce-Gibbons (julie.rattray@durham.ac.uk & andrew.joyce-gibbons@durham.ac.uk from the School of Education at Durham University.

Answering this questionnaire should require no more than 20 minutes.
All responses will be treated in strict confidence and only the researcher and their direct supervisors will have access to any details that could be used to identify the participants. If you wish to continue participation then once more provide email contact details, the next stage will be an interview that will be conducted at a location and time that is convenient to you.

By completing the questionnaire and pressing the "Finish button" you are agreeing to the information you supply being used in the research project.

You are free to decide whether or not to participate. If you decide to participate, you are free to withdraw at any time without any negative consequences for you.

Thank you once more for your collaboration. Your input is really valuable and important for my study.

Top of Form

Page 2: Confidential participant information

Location *Required*

Name: Contact Details: Email *Optional*

Page 3: Teacher Academic and Professional autobiography

What is the highest Academic Qualification that you hold? *Required*

Do you hold a formal teaching qualification or are you working towards this at this time? (Please specify) *Required*

What is this qualification?

Have you undertaken any formal or informal qualifications or training in Computing or ICT? (Please specify qualification achieved or level of training undertaken)

Please detail previous work, industry or business prior or during your teaching career?

What industry or business related qualifications do you hold?

Would you please give a short breakdown of your working career, there is no need to mention the names of any organisation, but details of length of service in particular roles or positions would be helpful?

I have completed a few details to act as a guide, although the detail you provide can be as much or as little as you want.

Royal Air Force 1997-1985 Sergeant

Computer graphics and Food Industry1985 - 1991 Customer Service Engineer

Food Production 1991 - 2001 Engineering Manager etc.

Your details:

Finish & Thank You

Appendix G.

Comparison of study data and Education and Training Foundation 2017 Report.

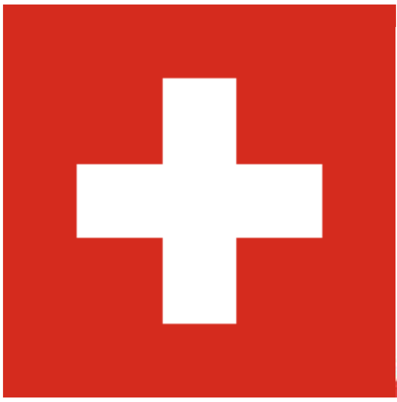
Comparison of data from Survey 1 and 2 and Education and Training Foundation 2017 Report			
Variable		**Stage 2 sample**	**Education & training foundation 2016 report**
Gender	**Female**	**120 (52.4%)**	**53%**
	Male	**99 (47.6%)**	**47%**
Education Level	**Level 7 or <**	**9 (33%)**	**25%**
	First Degree	**15 (56%)**	**33%**
	Level 4 or >	**3 (11%)**	**25%**
Teaching Qual.	**Achieved**	**23 (85%)**	**75%**
	Working toward	**4 (15%)**	**25%**
I.T. Qual.	**Level 4 or <**	**9 (33%)**	
	Level 3 or >	**6 (22%)**	
	None	**12 (44%)**	
Age	**50 or <**	**12 (44%)**	**36%**
	40 - 49	**11 (38%)**	**28%**
	30 - 39	**4 (15%)**	**22%**
	29 or >	**1 (05%)**	**12%**

Table 0.1: Comparison of data from Survey 1 & 2 and Education and Training Foundation 2017 Report

Appendix H.
One to One Interview Images & General Questions.

What do you believe to be the value of ICT to teaching and learning?

How would you describe your engagement with ICT in your teaching?



How would you judge your own confidence using ICT?

How do you usually feel when using ICT in your classes?

When using ICT in class what is the usual outcome when you reflect on the lesson afterwards?

What has been the effect of using ICT in class on your teaching practice?

How are decisions taken regarding ICT integration into teaching practice in the college?



Appendix I.

Participant transcript with coding:

Transcript Rose:

Me: How do you feel about using ICT and the value it gives in your teaching and learning practice?

Rose: I don't think it's necessarily the best thing since sliced bread, and I definitely don't think we can do without it completely, we we've gone too far the other way for that. He's meant to be kind of in between

2nd Order - Core beliefs, pedagogical compatibility

Me: Well this is sort of neutral, it's not a smiley face it's not an unhappy face.

Rose: Okay

Me: It's a neutral face.

Rose: And this is everything

Me: (Laugh) Put it on the scrap heap

Me: That's just throw it in the bin, yeah that's

Rose: Oh (Laugh)

2nd Order - Core beliefs, pedagogical compatibility

Me: (Laugh) Put it on the scrap heap

Rose: Okay, erm so I I'm probably somewhere between 2 and 1.

Me: Okay

Rose: Erm, this is from a teacher's perspective now

Me: From your perspective

Rose: I don't think it does them [the students] any favours because they haven't been taught how to make the best use of the technology that they have at their disposal, so a lot of what they use it for is not perhaps what we would like, from an educational point of view. So I'm kind of in between if we're to use it effectively I think first of all, they may have to give the kids alternatives because that's what they don't seem to have at the moment, they don't play games, they don't play with each other, don't communicate, they can't talk to anyone

2nd Order – Core beliefs
Teacher Pedagogical Compatibility

Negative impact - Disengagement

2nd Order - Core beliefs,
Project - Distance from existing culture

Negative impact - Disengagement

2nd Order - Teaching practices
Project – Distance from teacher's practice

else, so train them in the alternatives, how to read a book, how to comprehend what they've have read, how to spell all that stuff at the same time teach them how to use the technology effectively.

Me: From a teaching perspective how do you use it in the classroom?

Rose: I use a smartboard which I absolutely enjoy using and I try my best when the classes are not massive to have it interactive so they can come up to the board and work with stuff. I do find that kids, I teach Physics, for problem solving sometimes on a sheet of paper they cannot see which way to go and yet if I put them on the board, whether it's the size of it or just the situation they're in they're able to come up with a plan, it is much more interactive and the class becomes engaged. I use that mostly in that way for all my workshop support sessions, occasionally they'll go onto the computers to use some of the online software. We have quite a few that we use in Physics, but you have to be careful what you choose. You have to be ever so careful. There's a lot of stuff which is not quite correct, so we get them to use that and of course you probably heard of the Virtual Learning Environment. I probably don't use that to the best of my ability, I use it to give students access to the power point that I use, the teaching materials that I use.

2nd Order - Technology use
Teacher – Technology proficiency

Positive contribution

2nd Order - Technology use
Teacher – Technology proficiency

2nd Order - Core belief
Teacher – Pedagogical compatibility

2nd Order - Self-efficacy
Teacher – technology proficiency

2nd Order - Technology use
Teacher – Technology proficiency

Me: Ok so it's more of a repository for materials

Rose: Yes, occasionally I will give them work to do, and if I am short of time then yes I will put all their tests and classwork and homework on Moodle, but I don't use it quite as much as I should do,

2nd Order - Technology use
Teacher – Technology proficiency

Me: What would help you use it more?

Rose: I think fundamentally I am a teacher from the old school, I strongly believe in, still using the textbook because that's what we

2nd Order – Core beliefs
Teacher - Pedagogical Compatibility

have, but learn how to read, gleam the correct information you need from what you have read, be able to understand the information that's in front of you and then be able to use that information to answer questions.

Me: So you wouldn't read a book that I have called "Why do I need a teacher when I have Google"

Rose: Exactly (Laugh)

Me: How would you describe your engagement with ICT in your teaching?

Rose: I think in general I'm okay,

2nd Order - Self-efficacy
Teacher – technology proficiency

Me: Are you in the forefront, do you take the lead and drag your colleagues along with you?

Rose: No, I'm not a one

2nd Order - Self-efficacy
Teacher – technology proficiency

Me: Do you require a little bit of a push to use it?

Rose: Not really, I am in between, I'm not averse to using technology at all however I am not knowledgeable enough to be in the forefront.

2nd Order - Self-efficacy
Teacher – technology proficiency

Me: Do the college support you with training courses?

Rose: Yea they do, I mean I will probably, eventually be able to work stuff out, if I'm not sure, but it's just quite time consuming, so I depend on other people for helping me with the bits that I can't do. Some things I find more difficult than others, I can't use Excel,

1st Order - Lack of training
Teacher – technology proficiency

1st Order - Lack of time
Context – organisational culture

2nd Order - Self-efficacy
Teacher – technology proficiency

Me: You use what you are familiar and comfortable with?

Rose: Yes

Me: And that's the boundaries

Rose: I don't know if that work comes under this, and I think other teachers as well, your personality makes a big difference in your success as a teacher, I can't do anything that I find goes against my very grain, if you like,

Rose: Yes, I am a bit of a mother hen, I like to make sure that everything is done right and they are going to get it right, I need to

2nd Order - Core belief
Teacher – Pedagogical compatibility

let go, I recognise that, I feel like that's something that I need to work on

Me: Is that because you, let's look at the next question, how would you view your confidence in using ICT?

Rose: I'm not in despair, I think I will take a leap of faith, but I can't test it out on the students they're not here for that long, I can't you know, will this work will that not work, for any protracted period of time. So in small bites I'll check out little things and if it works use it if it doesn't think of something else, I will try, but I'm very watchful. I have to be sure that it's going to work for them.

2nd Order - Core belief
Teacher – Pedagogical compatibility

2nd Order - Self-efficacy
Teacher – technology proficiency

Me: That's perfectly reasonable,

Rose: I will try I'll try if there's, I can't think of anything particularly now, but if it's something that I think ah the kids might learn from this

Me: Do you use interactive white boards as they're perceived by the manufacturers with the singing and lights and buzzers and bells or do you use it as a projector for your power point presentations it's that sort of confidence?

Rose: When I taught in America for a few years, when I was there they introduced, the Promethean smart board and we went on a week-long training on how to use the board, prepare materials, do all sorts of stuff, using the white board and I think that's the best thing anyone has ever done for my teaching and the use of IT, because you don't know it's there unless you're pointed in that direction. I'm lucky because I had that experience where I can, I think I can use any white board and be able to, but I know that a lot of us do use it as just another power point projector, but I think I am able to use it a bit more than a lot of my colleagues they don't even try.

2nd Order - Self-efficacy
Teacher – technology proficiency

1st Order - Lack of training
Teacher – technology proficiency

Teacher efficacy

Me: Have your colleagues had similar training?

Rose: No, we haven't, we had a day, an hour, but because I know the difference between having a whole week and we were taken out, it was out of school time, so we went in, prepared all our materials. In August we prepared our materials using the white board that has helped me quite a bit.

1st Order - Lack of training
Teacher – technology proficiency

2nd Order - Self-efficacy
Teacher – technology proficiency

Me: That sounds to me the way to do it

Rose: That's what's missing you can't give someone a board like this and expect that they're going to know, there are lots of games, interactive activities that you can pull up, just from the software of the smart board, I use smart board for almost all the time. Except it doesn't work a lot of the time (Whisper)

1st Order - Lack of training
Teacher – technology proficiency

2nd Order - Self-efficacy
Teacher – technology proficiency

1st Order – Infra-structure & support
Context – Technological infra-structure

Me: Sorry

Rose: It doesn't work all the time

Me: Why is that?

Rose: Well we had a spate where it was totally not functioning for about a term,

Me: Infrastructure or bandwidth

Rose: it was the projectors that were being used, they either burnt out or something had happened, so we went for a long period without. All my materials had been for the interactive white board so I had to go back to using power points and basic white board.

1st Order – Infra-structure & support
Context – Technological infra-structure

Me: How do you feel when you're using ICT in the class?

Rose: The kids are very aware they don't need too much direction when it comes to using ICT so if I'm a bit short, the students can usually fill up the gap and because I teach students who do A levels in ICT computing I think I have an advantage. They'll tell me they found an app that does this that and the other and we'll try it and

Positive contribution

Negative impact - Distraction

their phones are their computers, so they do everything on the phone. I think what's probably making me more resistant is the fact that now with the phone the distractions are uncontrollable almost. There are some classes where you can't let them use them.

Rose: If you ask them to work on the computers you have to be standing at the back of the room so you can see all the screens because they are all on facebook, they check their emails they are on facebook. Also what I find is, critical thinking is going, because they don't have to think any more, you type the question into Google and you get an answer, they don't even critique the answer they're getting. You ask a question in class if you're not careful what you get is a response from Google so that they haven't even thought about the question they just want to hear the question. They regurgitate an answer which they found online. Terminology's not accurate, everything is not accurate. They don't know how not to plagiarise, we penalise them when they've taken a whole chunk out of Wikipedia, but they don't know otherwise

Negative impact - Distraction

2nd Order - Surface learning
Teacher – Pedagogical compatibility

Me: How do you feel when you're using ICT in your classes?

Rose: I don't feel overwhelmed by it at all, do I feel Yay to everything no because of the distraction, I am distracted I go on Google and I know what happens, maybe not totally Yay Yay so it would be somewhere in between. I think trepidation that comes from the fact that we are not taught how to use it effectively in the classroom therefore, the kids are not taught how to use it effectively in the classroom and therefore it's available the software's all there, but I think in the end the question is are the students learning and do they need ICT to learn.

2nd Order - Self-efficacy
Teacher – technology proficiency

Negative impact - distraction

1st Order - Lack of training
Teacher – technology proficiency

2nd Order - Surface learning
Teacher – Pedagogical compatibility

Me: When you reflect on the use of ICT how do you usually view the outcome of your class, is it all on the straight and narrow or do we have a complete train wreck or do you have too many questions or options at the end of it?

Rose: You have questions and options at the end of it, it's not one or the other because the world is definitely not straight, it's not a train wreck, although sometimes for some of the kids it might be. For some kids I think it's a train wreck not for many would I say it's a straight and narrow road, number 3 I guess in the majority of my lessons.

2nd Order - Core belief
Teacher – Pedagogical compatibility

Me: How are the decisions taken about ICT in the college?

Rose: I have nothing to do with it, since I'm a very small fish, but there will be consultation a little bit above my head I guess, there were some things that I ask for like the software that I use in Physics. At one stage I was the only Physics teacher so I would be in control of what kind of software we used.

College management,

Me: if you a blank piece of paper and we said resources don't worry about cost, how would you get more of your colleagues to use and integrate ICT into their teaching?

Rose: I would first of all take these boards off and have the Promethean, which is a better smart board, and I would train all staff and not just an hour, switch it on, do this, do that, do a nice long piece where everyone produces some amount of classroom materials using the white board. I would have computers available for the students, but what we have in the Science Lab all the desks have desktops, the kids are having to look over the desktops to see the board, and it's very intrusive when you're teaching it's in the way. I would have a better design where the monitors could be pushed away from the students until when they needed it, so one you would know when a student was on the computer if they weren't meant to be. We'd have software that monitors what they're doing from the front we would definitely have that, we had it before, but for some reason it went, where you could actually from the front see what each student was working on and you're able to give feedback. When the class is full, it's very difficult to give feedback.

1st Order – Infra-structure & resources
Context – Technological infra-structure

1st Order - Lack of training
Teacher – technology proficiency

1st Order – Infra-structure & resources
Context – Technological infra-structure

Me: Does the IT department meet your needs, you said earlier that the projectors went off for a term.

Rose: They do I mean that was slow because I think it had to do with

1st Order – Infra-structure & resources
Context – Technological infra-structure

the company, but I think too that these projectors had been in

for long enough where they were beginning to breakdown it took a

while, but they addressed that.

Me: How can you get your colleagues to engage more with ICT?

Rose: Some are really good, I think most people are trying, but I think you'll have one school, I might be in the Science department, maybe one of the very few, I don't want to say the only one, who uses a smart board completely, but that's because I have training. I'm not sure about all the bits around the smart as opposed to the other type of board, but that training has made a lot of things more possible for me. A lot of them just use it as a white board, or as a projector for their power point, but there's a lot you can do you can move stuff around on it, do graphs do calculations,

2nd Order - Self-efficacy
Teacher – technology

1st Order - Lack of training
Teacher – technology proficiency
targeted training

Me: So has ICT made teaching more effective for you?

Rose: For me yes, when I first went from overhead projectors to smart boards, with an overhead projector you are constantly facing the class, with these white boards at some point your back is to the class. One of the things that you can't get back from an overhead projector is that handle you have all the time of your students, what they're doing, when the activity needs to change because you're constantly turning. It means classroom management has totally changed because it's come from kids jumping on the tables and making a noise to this low level, which is worse, so much worse because they are like this, all the time they're not noisy they're sitting there they're quiet if you want them to be, but totally disengaged, whereas at least if they were noisy I knew okay you're not on task.

2nd Order - Core belief
Teacher – Pedagogical

2nd Order - Core belief
Teacher – Pedagogical compatibility

Negative impact - Class management,

Negative impact - Student disengagement

Me: It makes it a little bit more obvious

Rose: It was, I know it's going to come across as though I'm old fashioned, but it's not done the kids any favours, when I have a tutor group you come in in the morning and you chat just chat to each other, just talk that's all it is because even that's gone. My class you'll probably find the noise is higher than most.

2nd Order - Core belief
Teacher – Pedagogical compatibility

Me: How do we get this integration of being able to use the technology from a teaching perspective, from a learning perspective and not lose what many people believe teaching to be about which is an interaction between a group of people?

Rose: They'll take photos at first it was oh that's a really good thing the kids take pictures of you know the laws, but what's happened now no one wants to write any notes and which means that you I've got a derivation on the board, the only reason that I want you to write it down as I'm going through it is so that I you reinforce what I'm going through , but it's can I take a picture, you take 10,000 pictures of everything you've seen over the term how do you prepare for an exam I allow some of the time depends on how important I think the material is, but in Biology you have to learn how to draw you're diagrams having a picture on your phone is not going to help you when you get into the exam,

Negative impact – surface learning

Me: Okay, do you want to add any more,

Rose: Well not really no unless you have

Rose: I think on the day that you want to be lazy you get your power point put everything you want to get the kids to know on the power point and then you can just go from slide to slide. I don't know if from a teacher's perspective also you can use it as a way out, sticking the

2nd Order - Technology use
Teacher – Technology proficiency

kids in front of a computer and giving them some software to work on, is an easy way out I think, I'm not criticizing any teachers because there are sometimes when we need to step away, but I think in some schools, it's way to prevalent where they come in in the morning there's virtually no instruction and the kids are put in front of a screen.

Me: Okay well thank you very much I hope it hasn't been any traumatic

Rose: No not at all, as long as it's

Me: Thank you for your time

Rose: Pleasure, I hope it's been some help

Me: Very much appreciated

Rose: Thank you very much

Appendix J.

Profiles of teachers taking part in the one to one interviews.

Lynn:

Female aged over 50 with over 20 years of teaching experience in FE, now working at an institute in the North East of England. Lynn has a First degree and a Cert Ed. and Post Graduate Diploma in Education. She teaches on a Vocational Related programme and has more than six years of experience using technology in her teaching practice. Prior to teaching Lynn worked as a TAX inspector and within the Tourist Industry. Lynn has no formal qualifications or training in the use of technology but has undertaken several internal and external CPD courses in the area.

Lynn uses ICT to search and collect information to prepare lessons, collect resources to be used in lessons all the time. She often uses applications to prepare presentation for lessons, but rarely evaluates digital learning resources. Lynn sometimes creates her own digital learning materials for students, prepares exercises and tasks for students, uses ICT to provide feedback or assess students' learning, browse or download material from the college's website or other learning platforms and identify CPD opportunities. Lynn uses material within her teaching practice sourced from the internet and existing educational sources as well as material that she has created as well as from the college intranet and mainstream websites.

Lynn believes technology integration is affected by many factors, access to and availability of hardware, a lack of training and support in how to integrate and use technology in teaching. Lynn assesses her own self-efficacy as good in routine tasks, but has little confidence in the more specialist technical aspects like creating a database of programming

Mike:

Mike is a Male aged over 50 years, or more. He has been teaching in a college of Further Education in Midlands for over 20 years, teaching in the Computing and Design subject area on courses offered by the institute. He has been engaged with technology in his teaching practice for over 6 years. Prior to becoming a teacher Mike worked as a computer services manager. He has Post Graduate Diploma in Information Systems and a PGCE teaching qualification. Mike has undertaken CPD courses both internal and externally provided.

Mike uses ICT to search and collect information to prepare lessons and collect resources to be used during lessons often. He uses applications to prepare presentations for lessons, creates his own digital learning materials and prepare tasks and exercises for students frequently. He uses ICT to provide student feedback sometimes, but rarely evaluates subject specific digital learning resources. Mike often researches material from the college website and other learning platforms. He searches for other CPD opportunities very frequently. Mike uses materials sourced from the internet, utilizes existing material from established educational sources and the college's intranet as well as using electronic offline material. He creates his own material as well as sourced from mainstream websites.

Mike believes technology integration is adversely affected by bandwidth issues and low specification hardware as well as external pressure to meet exam targets. He assesses his self-efficacy as high in all the tasks required for his job.

Ray:

Male aged over 50 has been teaching in a college of Further Education in the Midlands for between 4 and 6 years, teaching an Academic subject area offered by the institute. He has engaged with technology in his teaching practice for more than 6 years. Prior to becoming a teacher Ray worked as a control-systems Engineer. He has a PhD and a BEd (Hons) teaching qualification. He has undertaken CPD courses in the number of areas both internally and externally.

Ray sometimes uses ICT to search for and collect information to prepare for and use during lessons. He uses applications to prepare presentations for lessons and creates his own digital learning materials sometimes. He rarely uses technology to provide student feedback or search for CPD opportunities and browse the college website, but sometimes uses technology to prepare tasks for students, evaluate digital learning resources and browse material from other learning platforms. Ray uses material during his teaching practice sourced from the internet, existing online material from established educational sources and mainstream websites in addition to creating his own material. He doesn't use material from the college intranet or any electronic off-line material.

Ray believes technology integration is affected adversely by low specification hardware and pressure to prepare students for exams. Ray does not use or take part in any form of social media activities he assesses his self-efficacy as high in all other areas of technology use.

Philip:

Philip is a Male aged over 50 has been teaching in an FE institute in the North East of England for between 4 and 10 years in an Academic subject area. He has a Level 4 qualification and is at present studying a teaching qualification. He has gained an ECDL IT qualification and has been using technology in course delivery for more than 6 years. Prior to teaching he was in the Military and Police Force. Philip has undertaken CPD courses in technology from both internal and external courses. Philip uses ICT to search and collect information to prepare for and use in lessons all the time. He sometimes creates his own digital learning materials and preparing exercises or tasks for students. Philip rarely uses ICT to provide student feedback, evaluate digital learning resources or browse material from the college website. He often uses applications to prepare presentations, download material from other learning platforms and research CPD opportunities. Philip uses material sourced from the internet and existing educational sources and well as material from the college intranet to create his own material. He does not use off line electronic material or material from mainstream websites in his teaching and delivery.

Philip believes technology integration is affected by access or availability of hardware in the college and lack of support as well as teacher resistance to integration.

Nancy:

Nancy is a Female aged between 40 and 49 she has been teaching in an FE institute in the North East of England for between 11-20 years delivering courses on a Vocational programme. She has a First Degree and a Cert. Ed. teaching qualification. Although Nancy has no formal qualifications in IT she has been using technology in delivery of courses for more than 6 years. Prior to teaching she worked as a Nursing Assistant in the National Health Service. Nancy: has undertaken a number of CPD courses provided both internally and externally by the college.

Nancy uses technology to search and collect information to prepare for and use in lessons all the time, additionally she uses technology to prepare presentations to use during lessons and identify professional development opportunities all the time. Nancy sometimes provides students feedback or assesses student progress sometimes as well sometimes downloading material from external learning platforms. She often creates her own digital material for students and sets exercises and tasks using ICT. She browses material from the college website and evaluates digital learning resources often. During teaching and delivery Nancy uses material that she has searched and sourced from the internet and existing online educational sources, in addition she utilises the college intranet as well as mainstream websites, off line electronic materials, such as CD-ROM, and materials of her own creation.

Nancy believes integration of technology is affected by lack of hardware and low specification equipment in the college and lack of teacher skills. Nancy assesses her self-efficacy as good in all areas of her job except creating a database or programming

Gill:

Gill is a Female aged over 50, she has been teaching in an FE institute in the Midlands of England for over 20 years delivering Vocational specific courses at the present time. She has a Cert. Ed. as her highest qualification. Although Gill has no formal I.T. qualification she has been using technology as part of her delivery of courses for over 6 years. Prior to working in F.E. she worked as a Nursery nurse and primary school reading specialist. Gill has undertaken a range of CPD courses related to technology provided both internally and externally.

Gill uses ICT to search and collect information to prepare for and use in lessons and downloads material from the college website all the time. She uses ICT some of the time to prepare presentations, create materials, evaluate digital learning resources and source material from other learning platforms. Gill rarely uses ICT to feedback to students or create exercises or tasks for learners. She often uses ICT to prepare tasks and exercises for students. During teaching and delivery Gill uses material that she has searched and downloaded from the internet, online educational sources as well as mainstream websites. She utilises the college intranet and creates her own material, but she does not use off line electronic resource like CD-ROM during delivery.

Gill believes integration of technology is adversely affected by lack of content and pedagogical models. Gill assesses her self-efficacy as good except in areas like spreadsheets and programming.

Peter:

Peter is Male aged between 40 and 49, has worked in an FE institute in the North East of England for between 11 and 20 years delivering Academic courses. He has an MSc and Cert.Ed. teaching qualification. Peter has been using ICT in his delivery and teaching form more than 6 years and has a Level 1 qualification in IT. Prior to working in education he worked as a farm worker and graduate research technician. He has attended a range of internally provided CPD courses related to technology. Peter uses ICT to search for and collect information and resources to prepare and use before and during lessons as well as prepare presentations often. He sometimes creates his own digital material, evaluates digital learning resource and prepare exercises and tasks for students. Peter uses ICT to provide feedback to students and browse or download material from the college website all the time. He often utilises other learning platforms, but rarely researches CPD opportunities related to using ICT. Peter uses material sourced from the internet, mainstream websites and creates his own material. He also uses existing established educational sources, the college intranet and offline electronic materials.

Peter believes that technology integration is adversely affected by infra-structure or access to portable devices. Peter assesses his self-efficacy as being good in tasks required for production and use of materials, but low in higher level skills like programming or editing images.

Dan:

Dan is Male aged over 50 and has worked in an FE institute in the North East of England for over 20 years delivering Academic courses. He has a first degree and indicated that he has a teaching qualification. Dan has a Degree in IT and has been using technology in his delivery for more than 6 years. Prior to teaching he worked as a programmer.

Dan has undertaken CPD in a range of courses provided both internally and externally by the college. Dan uses ICT to search for and collect information and resources to prepare and use before and during lessons as well as prepare presentations all the time. He sometimes creates his own digital learning material, provides feedback to students and researches CPD opportunities. Dan utilises ICT often to evaluate digital learning resources and browse or download material from the college website and other learning platforms. He uses ICT to prepare exercises for students all of the time. Dan uses material that he has searched the internet and existing educational sources for to use in class during teaching and delivery. Other sources of material that he uses are the college intranet, mainstream websites and material he has created, he does not use off-line electronic materials such as CD-ROM.

Dan believes that technology integration can be adversely affected access and availability to hardware and low specification equipment as well as external pressure to prepare for exams. Dan assessed his self-efficacy as high in all the identified tasks.

Geoff:

Geoff is Male and aged between 30 and 39, he has worked in an FE institute in the North East of England for between 4-10 years delivering courses in the Vocational related areas. He has a PGCE teaching qualification. Geoff has a Level 3 qualification in IT and has been using ICT in his delivery for more than 6 years. Prior to teaching he worked in retail management. Geoff has undertaken internal CPD courses some areas directly related to the courses he delivers.

Geoff uses technology to search for and collect information and resources to prepare and use before and during lessons and prepare presentations and his own digital material all of the time. He prepares exercises and tasks for students all of the time and often uses technology to provide feedback. Geoff often evaluates digital learning materials, but never browses or uploads material from the college websites or other learning platforms or to research CPD opportunities. Geoff uses material sourced from the internet and mainstream websites and creates his own material. He does not use material from established educational sources or the college intranet nor offline electronic material such as CD-ROM.

Geoff believes that ICT integration into teaching and learning can be adversely affected by the lack of adequate content. Geoff assesses his self-efficacy as high except in programming.