

**BARRIERS TO INTEGRATING ICT INTO THE UK PRIMARY
SCHOOL CURRICULUM: A CASE STUDY APPROACH**

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ABSTRACT

The research question which guided this exploratory case study is, in essence, looking at causes in non-implementation of change, specifically consideration of how confidence and emotions have been factors not taken into account when considering Continued Professional Development programmes and the implementation of the ICT initiative.

The research was carried out as a three-case case study. There was no intent in this study to determine causal effects. Rather, it was more to consider the role of factors such as confidence, what part it plays and how this could impact on Continued Professional Development (CPD) which would lead to effective classroom practice.

In considering such an approach, the questions of what constitutes change and confidence and how it is manifested in the classroom situation will be considered using a 3D mathematical metaphor to help demonstrate change.

The data gathering was accomplished through a number of different instruments: a survey questionnaire based around the questionnaire used by the IMPACT project (slightly modified to take account of the different project) (Harrison, et al, 1998). The specific information obtained from the instrument included specific computer uses, computer experience and training background; Pre- and Post-classroom observation interviews; a free response narrative; and to aid in communicating their thoughts on their current attitude and usage of ICT and to further help gain an insight as to the affect of emotion on ICT diffusion, each participant was also asked to complete a mind map task (Buzan and Buzan, 2003) based around the main subject of "Computers and Me".

The case study suggests that effective CPD for an ICT initiative is best approached through a bespoke programme taking into account teachers' individual emotional needs, backgrounds and experiences.

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My wife, Kate and children Nathan and Kieran who, always eager to see the finished product, were there when I needed it and gave me space when it was all getting a little bit fractious! Now we can concentrate on their degrees and careers!

It is with great regret that my father did not live long enough to see me get this final degree and that my mother is not able to understand that her elder son has finally finished University.

Timothy Gray
Seoul, South Korea.

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CHAPTER 1 INTRODUCTION

A number of writers have compared the Information Society to the Industrial Revolution in terms of its eventual impact on our world and, not surprisingly, a considerable literature has emerged, which ranges from classic insights (e.g., McLuhan and Fiore, 1997; Bell, 1976; Rogers, 1995), to comprehensive scholarship (e.g. Castells, 1996), to popularized accounts (e.g. Toffler, 1990 and Negroponte, 1995).

In 2001, the then British Prime Minister, Tony Blair, contended that digital technologies:

... have the potential to improve achievement in our schools and colleges, to boost the prospects of British industry and commerce, to offer opportunities to all learners, particularly those who would otherwise be excluded, and to significantly enhance our quality of life.

(Cited in Department for Education and Skills, DfES 2005, para.1)

Since that speech, many studies have been undertaken on the effects of ICT on children's learning and many more on the use of ICT in the classroom. These studies have itemised levels of use, feelings towards ICT, and hardware distribution. They have looked at the mechanics of successfully implementing ICT into the curriculum. But what of those classes where the implementation has not been successful? What are the factors that have contributed to its failure and can they be sufficiently identified in order to inform future professional development?

Numerous studies have shown that the hardware itself has a major impact – lack of it, its reliability, ways of integrating it, understanding of it. But what of the teachers themselves? Are we missing something on the more personal level that determines how a teacher uses ICT? Studies such as IMPACT2 (Harrison, 2002) and others have indicated that there are areas to be pursued here. The relationship between teachers and ICT is complex but perhaps by looking at individual cases we can gain more insight into these relationships.

This case study considers non-implementation of change. Research that will be reported will argue that the key areas of focus in this study - teachers' attitude to the use of ICT in the curriculum looking at confidence and emotions, the impact on the way ICT Continued Professional Development programmes are delivered has an impact on the level of success of ICT diffusion initiatives.

In trying to answer the question as to whether we can generalise from this instance, this study will use a comparison across a small cohort of teachers – from one who has ICT integrated into the lessons to who doesn't. The boundaries of the case are defined by asking four research questions:

- What part does teacher confidence play in the integration of ICT into the classroom?
- What has an impact on this confidence?
- What implications does this have for continued professional development (CPD)?
- Can we model the case study into a proposal to help other teachers?

Through this case study, it is hoped that informed judgements may be made about how the findings have relevance to Continued Professional Development (CPD) Programmes in general by linking to data from other research to demonstrate where the case study example fits in relation to the current provisions for CPD in UK state primary schools. From this case study it is hoped that it can be used to determine whether the propositions from which the questions were raised are correct or whether an alternative set of explanations might be more relevant.

This exploratory case study is, in essence, looking at causes in non-implementation of change, specifically consideration of how confidence and emotions have been factors not taken into account when considering CPD and the implementation of the ICT initiative.

1.1 The Research Problem

The research question which guided this exploratory case study is, in essence, what impact could considering teacher confidence and emotions have when developing CPD for the implementation of an ICT initiative?

The importance of teacher professional development for school improvement has been highlighted by many writers (Fullan and Hargreaves, 1992b; Guskey and Huberman, 1995; Osterman and Kottkamp, 1993; West-Burnham and O'Sullivan, 1998, Pianfetti, 2001, Sandholtz, 2001, BECTA, 2007).

Continued Professional Development (CPD) for Information and Communication Technology (ICT) faces a growing challenge of establishing and implementing strategies to develop knowledge and skills for the teachers to effectively use technology in the classroom. Reports from OfSTED (OfSTED, 2002c) have highlighted concerns about the apparent lack of success of such training initiatives. There are many contributing factors such as lack of skill or unreliability of equipment. But use of words such as 'confidence' and 'anxiety' by the government and OfSTED to describe teachers' attitude to ICT raises the question of whether factors other than skill and method of delivery need to be considered.

There is a growing emphasis now being placed on the child being able to rationally apply his or her skills and knowledge to unfamiliar situations – to develop their problem-solving skills. Combined with the Government's initiatives to raise the pupil/computer ratio, to supply laptops to teachers for

home and school use and to have ICT taught through a cross—curricular approach, there would seem to be a strong case to consider what strategies build teacher confidence in technology to the extent that they feel more able to work with ICT in the classroom.

1.2 Basis for the thesis questions

This research project aims to investigate what part confidence plays in the way primary school teachers integrate the technology into the classroom. This is not a new area, but by approaching the area through the use of a small-cohort case study (three teachers within a 0-10 range of ICT ability from 0 (none) to about 7 (reasonably competent)), it was hoped to gain more of a specific insight into the attitudes of in-service (as opposed to in-training) teachers to this initiative. Discussion will also cover the impact this could have upon CPD programmes.

1.3 Thesis structure

The thesis is organised as follows:

Chapter 1 sets out the background for the thesis, its origins, the research approach and the four questions bounding the case.

In Chapter 2 an initial review of the key literature areas related to the concerns of the study is provided. Continued professional development (CPD) is an important part of the change process when introducing a new initiative and this is considered from a range of different aspects – what the role and management of confidence and emotions in the effective design of CPD training can play in designing these programmes.

Chapter 3 discusses the participants' selection, the research method used including justification for using a case study approach supported by questionnaires, interviews, narrative responses and classroom observations for additional data and graphical organizers such as Mind maps as a means to assess implementation of authentic change.

Chapter 4 presents the results of the data from the individual case analyses.

Chapter 5 discusses the results of the cohort analysis using background information from the literature search and the impact of emotions in planning CPD provision.

Chapter 6 discusses the findings.

Chapter 7 summarises and considers building theory from such a case study and the implications of such a study for ICT CPD along with the limitations of the study and avenue for further research. It also discusses the study's contribution to the body of knowledge relevant to the research field and implications of the thesis for future CPD programmes.

CHAPTER 2 CONTINUED PROFESSIONAL DEVELOPMENT AND ICT – WHAT IS KNOWN?

2.1 The Literature Research – overview

This chapter starts with a general introduction to the areas being covered, placing the review within the research from a political and educational initiative timeline context.

Because there is a strong emphasis on Continued Professional Development and its links to effective ICT diffusion, this chapter considers research into the design and implementation of CPD and specifically the role of teachers' emotional reaction to ICT experiences in designing such CPD.

Following their use in the Impact2 studies (Harrison *et al*, 2002) the literature research also considers the use of graphical organisers (specifically 'mind maps') for recording participants' views about the subject.

2.2 Introduction

Teachers possess many skills that they use every day in the classroom. Generally they are confident and at ease with the tools they use and the subjects they teach. There is, however, an area which often proves emotionally problematic for the teacher, thus hindering its effective implementation – the use of Information and Communication Technology (ICT) and its associated government training initiatives (Kay, 1989; Koohang, 1987, OfSTED, 2002c, Beastall, 2006; Conlon, 2004; McCarney, 2004; Condie *et al.*, 2005; Stark *et al*, 2002, OfSTED, 2005).

Despite the fact that Information and Communications Technology (ICT) has become a common feature of schools worldwide, its influence on education and learning has been far less than what

would be expected from such a versatile and useful tool. Recent reports by OfSTED have highlighted concerns about the failure of the Information Communication Technology (ICT) in schools training initiative: “While effective use of ICT in teaching subjects across the curriculum is increasing, good practice remains uncommon.” (OfSTED, 2001b, 113). Approaches used for the Literacy and National Numeracy strategies were successful (OfSTED, 2002a; OfSTED 2002b), so why was this not the case for ICT (Kay, 1989; Koohang, 1987; OfSTED, 2002c; Cox, Preston and Cox, 1999a and 1999b)?

In current classroom applications ICT serves two main objectives:

- to help pupils acquire confidence and pleasure in using new technologies, become familiar with some everyday ICT applications, and be able to evaluate the technology's potential and limitations; and
- to enrich and extend learning throughout the curriculum by supporting collaborative learning and independent study as well as by enabling pupils to work at a more demanding level by averting boring, time consuming, routine tasks (Drossos and Kiridis, 2000).

Whereas early ICT initiatives in schools were essentially technology driven, aiming at developing teachers' "computer literacy," ICT started to be regarded gradually not only as a skill worthy to acquire but also as a valuable tool for the development of other skills. As a result, nowadays, ICT has become a significant component of school curricula, a supportive tool for providing teachers and students with enhanced teaching and learning opportunities in the whole range of school subjects. The content of the national curriculum statements of countries such as the UK, the USA and Australia provide clear evidence for this shift from the teaching of ICT alone to the infusion of ICT

as a significant tool in the school curricula (Drossos, 1998; Oliver, 1994, Scrimshaw, 2004, Condie *et al*, 2007).

The National Grid for Learning (NGfL) gave initial, if highly underused support (Gray, L, 2002) and though money was given through other initiatives, they were to fund the introduction of hardware rather than the integration of the of ICT into the curriculum. In the schools, the 1.6 billion pound NGfL initiative represented an unprecedented government commitment to educational use of information and communications technology (ICT). Prior to its closure in 2006 this initiative's tripartite focus was on: *infrastructure* (i.e. hardware/connectivity to the Internet); *content* (i.e. educational software and online content); and *practice* (i.e. teacher training and subsequent use of ICT by teachers and learners) (Selwyn, 1999, p2).

Despite this, good practice in the use of ICT in primary schools is largely marginal and still not well established. Cuban (2001), for example, found in his research few teachers who reached the "invention" level of technology integration and, indeed, that in the USA's elementary school setting, most schools remained at only the adoption level. From his observations, Cuban concluded that computers in preschools and elementary levels were used most often during "choice time" (p 50), when students can choose from various activities offered by different learning areas in the classroom, and to maintain current instructional practices. Cuban also found that computers were considered less important than the traditional models of instruction which were sustained rather than transformed. Cuban also found that, nationwide, reports show that word processing is the most common reason for computer use. Similar results were found by OfSTED (2001b) and Condie, *et al* (2007). Furthermore, a small number of primary schools are still being supplied with machinery with help

from parents through various commercial voucher schemes such as the one run by the TESCO supermarket chain. Although there are indications that in many cases the injection of ICT hardware in these schools is substantial, it has become evident that teachers must be provided with at least some theoretical assistance, in order to reduce resistance to change (Fullan, 1991, Cuban, 1993, Rogers, 2003). Thus, the Department of Education (DfES) published in 1997, a general framework for the introduction of ICT in primary education, which is consistent with these new trends.

According to the DfES new technologies should be used in primary schools such as:

- * learning tools;
- * teaching tools across the curriculum;
- * tools for communication and search of information; and
- * tools for the development of ICT literacy (DfES 1997).

At that point the following question could have been asked: are teachers able to contribute to the smooth introduction of ICT in schools and to employ it effectively in the classroom?

Recent research highlights concerns over this integration of ICT into the curriculum and its impact on children's learning (Preston *et al* 2000; Selwyn, 1999; Fabry and Higgs, 1997; Andrews, 1997; Hoffman, 1996; Kirkman, 2000; Kennewell *et al*, 2000, BECTA, 2005, BECTA 2006). With the introduction of interactive whiteboards, there is growing pressure on teachers to write their own interactive lessons. However, confidence is again an issue. Without adequate training and without in-school support, teachers are finding it difficult to gain the confidence in creating these presentations (and with the demise of The National Whiteboard Network in 2007, it has become more

problematic). The integration is down to using ICT as a more visually stimulating method of presentation. Schemes of work like those produced by Cheshire LEA address the ‘What do I do now?’ question. They are prescribed and, like other aspects of Curriculum 2000 were designed as ‘recipe books’ for teaching the subject.

The evidence for the learning benefits of the integration of ICT in the curriculum constantly increases (Frear and Hirschbuhl, 1999; Chen and Looi, 1999; Mioduser *et al*, 2000; Ronen and Eliahu, 2000; BECTA 2005, BECTA 2007), while at the same time the failure of teachers to make significant use of and impact with new technologies in the classroom is also well documented (Dawes, 1999; Underwood, 2000; Raven, 2005; Shackel, 2004; Wong, 2008, Piave and Iadecola, 2009).

This is not at all paradoxical, since the studies which present the evidence for learning gains of the utilisation of ICT in the learning process have largely been carried out in laboratory-style environments or with the participation of teachers who are considered to be either particularly effective or keen to take part in action research, technology innovation, or curriculum development projects (Kennewell, 1997).

However, the vast majority of teachers fail to exploit the new powerful technologies in everyday teaching practice. Although ICT education has become a significant component of teacher education programmes, these courses appear unable to provide teachers with the skills and attitudes necessary for the meaningful application of ICT in the classroom (Williams, Coles, Wilson, Richardson, and Tuson, 2000; Watson, 1997; Handler and Pigott, 1995, OfSTED, 2005).

Providing opportunities to help staff develop is one of the most frequently used managerial competences (Spencer and Spencer, 1993) but the teacher as a person is often overlooked as so many In Service Education and Training (CPD) programmes take the form of something that is done to teachers rather than with them and the ‘emotional dimension’ (Day and Leitch, 2001) is ignored:

Because much staff development is fragmentary in nature, rushed in its implementation and top-down in its imposition, it addresses only a fragment of the teacher. It ignores different needs among teachers related to years of experience, gender and stage of career and life. It treats the teacher as a partial teacher not a total teacher (Fullan and Hargreaves, 1992b, p27).

2.3 Emotions and ICT Diffusion

This emotional dimension which, according to Mayer and Salovey (1993, p433), involves, amongst other skills, the ability to monitor others' emotions, to discriminate among them, and to use the information to guide thinking and actions, gave rise to what Goleman (1995) popularized as ‘emotional intelligence’. Acknowledgement of these concepts may be of use in helping teachers overcome some of the anxieties they show towards ICT.

Researchers such as Feist and Barron (1996) have investigated these emotional dimensions by measuring related concepts, such as social skills, interpersonal competence, psychological maturity and emotional awareness. Teachers have been teaching (though not always consciously) the rudiments of emotional intelligence in classes such as "social development," and “citizenship”, all

aimed at "rais[ing] the level of social and emotional competence" (Goleman, 1995: 262). Social scientists are just beginning to uncover the relationship of emotions to other phenomenon, e.g., leadership (Ashforth and Humphrey, 1995), group performance (Williams and Sternberg, 1988), individual performance, interpersonal/social exchange, managing change, and conducting performance evaluations (Goleman, 1995).

In light of the report which discusses continued concern over teachers' emotional attitudes towards ICT (OfSTED, 2002c, p11) and because the government considers that ICT is so important in current education, a better understanding of the role of emotions and emotional intelligence in managing staff development may help us towards more effective ICT CPD for teachers.

2.4 Link Between Emotional Confidence and ICT – Some Background

In 1995, the British government proposed the inception of the "Superhighways for Education" – multi-media links through the internet for research and communications for both the teachers and the pupils. By 1998, the internet-based resource, the National Grid for Learning (NGfL), which was to have created a 'connected society', improved the quality and availability of educational materials and widened access to learning, was to be the banner carrier for this electronic crusade. This crusade was fuelled by the government's growing concern that the UK's workforce was lagging far behind in innovational use of ICT and they saw part of the solution was in "helping our businesses to compete" (Tony Blair in DfES, 1997, introduction) by training teachers to use ICT to help the children and to become proficient ICT users and eventually achieve the key message of the document – that the UK will be the best and will overtake all the others.

Over the next few years, the government continued promoting the virtues of computers in the classroom. In particular they saw the future for the children in the use of the Internet as another tool for research and have all schools, libraries, colleges and universities linked to it by 2002 (Howarth, 1999). However, the government found that despite its efforts, ICT in British schools lagged far behind their counterparts in Europe (DfES, 1998) and, in 1997, the Government published plans to extend the use of ICT in maintained schools.

Within this ambitious project, the Government set itself a number of targets, one having a major implication for teacher CPD, namely that "serving teachers [were] to feel confident, and be competent, to teach using ICT within the curriculum" (DfES, 1998, p3). With other initiatives such as the National Numeracy and Literacy Strategies, the focus was on the teachers' '*competence*'. Although it is therefore significant that the word '*confidence*' was used in the context of ICT, its inclusion appears to have been lost by those who had their bids for providing ICT training accepted. In none of the training providers' literature outlined in the 'Red Folder' (NGfL, 2000) was there mention of dealing with teachers' attitudes or confidence.

Research in the area of confidence in ICT by Copps (1999), has shown that, although there had been a four-fold increase of the number of schools connected to the Internet between 1989 and 1999, for the same period there was only a 3% increase of teachers who actually felt confident using computers (and especially the Internet) in the classroom. Other researchers (Bosch and Cardinale, 1993; Topp *et al*, 1995; Akbaba and Kurubacak, 1998, and, using a worldwide assessment project, Pelgrum, 2001) revealed a number of areas that both new and experienced class teachers have cited as having an effect on their confidence in the use of ICT : They felt that they had been ill-prepared

to use computers in their classroom; there was a feeling that they would lose their authority to the often better-skilled students and they had a feeling of inadequacy stemming from their emotional reaction to a technology that they little understood and that may even be instrumental in a major change in their role in the classroom (from one of ‘information-giver’ to one of ‘information-facilitator’).

The introduction of the government’s ‘laptops for teachers’ (Harrison, 1998) initiative moved the emphasis away from one aspect – that of not having enough time to ‘practice’ in school time. Similar to the introduction of National Grid for Learning (NGfL) training, the onus was placed on the teachers to ‘go away and try it out at home’. In many cases this proved advantageous. Teachers certainly made more use of set programs such as wordprocessors, spreadsheets, DTP, presentation and the internet, mainly for preparation of planning, worksheets and jumping off points for lessons (Harrison, *et al*, 2002).

Although this lack of practice time may be a contributing factor, use of words such as ‘confidence’ and ‘anxiety’ by the government and OfSTED (OfSTED, 2002c, p11) to describe teachers’ attitude to ICT raises the question of whether consideration of teachers’ emotions is a factor that needs to be considered in planning a successful ICT (or any) training programme. From previous research for assignments, there is mounting evidence that confidence plays an important role in the implementation of any new initiative (Gray, T, 2002). This is particularly so with regards to ICT. In an initial research study conducted by Harrison *et al* (1998), they found that less than 50% of the teachers were happy about their initial training and that a low level of confidence was an influencing factor in the initiative’s inability to have a significant effect on what goes on in the classroom. A

number of authors have focused on this area. While some (VanFossen, 1999; Wild, 1995) found that by focusing on basic skills, the training failed to prepare teachers to integrate ICT into their classroom, others such as Snoeyink and Ertmer (2001) found the opposite to be true, that teachers preferred to be taught the skills before considering the integration of the technology into their pedagogy. One area that is causing more concern (Simpson, *et al*, 1998) is who teaches the trainee teachers. The institution tutors have little experience in using the technology in the everyday classroom and thus the trainees lack practical models of integration (Whetstone and Carr-Chellman, 2001).

For those teachers, however, who have been practicing longer, this is not relevant. Attitudes towards ICT are more influential on its integration to these teachers (Ertmer *et al*, 1999). Fabry and Higgs (1997) suggested three groups of attitudes: innovativeness, relevance and self-confidence. These anxieties about the changes being imposed by ICT are highlighted by Larner and Timberlake (1995), while Bradley and Russell (1997) highlighted anxiety caused by the possible embarrassment of not understanding the technology and the fear of losing professional status through a change in pedagogical skills (Fabry and Higgs, 1997; Bosch and Cardinale, 1993; Topp *et al*, 1995; Akbaba and Kurubacak, 1998).

2.5 Continued Professional Development and Information Technology

New government initiatives have been linked with some form of Continued Professional Development (CPD) for those teachers involved in their implementation. This CPD, which took the form of 'this is the way it should be done and here is the manual to direct you how we think it is best for you to do it', was used for the introduction of the Numeracy (NNS) and Literacy (NLS) strategies

into schools (DfES, 2000b; DfES, 1999b). In this rationalised process, the CPD was designed to show how the given tasks were to be broken up into a variety of components, each one being handled in a pre-determined sequence until the tasks were completed and the child could be assessed as to whether he or she had reached the target. Following extensive CPD, the manuals were published showing the order in which the topics should be covered and the number of days to be spent on each topic in order for all the children to reach what was considered to be a minimum level of achievement. In an approach bordering on what Ritzer (1996) called the 'McDonaldisation process' (because it offers efficiency, calculability and predictability), this method gave the optimum method for getting from one curriculum target to another (efficiency), comparative data for the production of the school 'league tables' (calculability) and the subject was rationalised so that only the delivery of the content's implementation was considered (predictability). In its reports on the success of these two initiatives, OfSTED highlighted the positive role this form of CPD played (OfSTED, 2002a, 2002b).

But this apparent success has not been reflected in the training for the recent ICT initiative (OfSTED, 2002c, p11). Although ICT adoption studies constitute a significant area of research within the information systems arena (Fichman, 2000), there continues to be a need for better understanding of the factors that drive or inhibit the adoption and use of ICT within the specific context of education. Perhaps there was another dimension that needed to be considered - a dimension to be considered by the use of words such as 'anxiety' and 'confidence' in the reports discussing concern for the lack of the success of the ICT CPD? Such a dimension has been raised in West Burnham and O'Sullivan's (1998, p175) argument that in order to make all such CPD courses as effective as possible, there is a need to focus not just on process and policy but, just as importantly, on the people. Hargreaves (1998, p 835) underlined this approach when he wrote about "those who initiate and manage

educational reform ignore or underplay one of the most fundamental aspects of teaching and how teachers change: the emotional dimension.” Perhaps this is even more important in the case of ICT where research by such as Akbaba and Kurubacak (1998) has highlighted that teachers’ positive emotional reaction to ICT has a positive influence on student learning and the utilization of ICT in the classroom.

In the 1999 British Educational Suppliers Association (BESA) survey (Copps, 1999), teachers rated themselves as confident in a number of different ICT areas whereas in other surveys (OfSTED, 2001b, DfES, 1999a, p18) where the ratings were completed by teachers' line managers, which produced a different result (only 50% of teachers rated themselves as confident, whereas over 68% were rated confident by others). This concept of confidence is part of one of the fundamental aspects of how teachers change; what Day and Leitch (2001), Fineman (1993) and Hargreaves (1998) refer to under the heading of the 'emotional dimension' of staff development.

The failure of the CPD linked to the ICT initiative (and, indeed the discrepancies between the BESA (Copps, 1999) and OfSTED (2001b) results) was attributed to many factors in these reports. Two areas, were not, however, mentioned. First, the fact that CPD facilitators have their own agenda based on what is required of them and what they perceive is required by the teachers with no consideration for the individuality of those teachers. The teachers are learning in batches and have been cast, according to Fullan and Hargreaves (1992a, p177), in "a fundamentally passive role with regards to content and format of CPD, typically serving as audience for a performance staged by others". With so many changes being introduced, now, more than ever, CPD managers need to understand the teachers' emotional attitudes towards the subject before attempting to provide relevant

courses or integrate new programmes into the classroom. Second, no recognition of the emotional context of the training in which the teachers operated was mentioned.

In its 2001 interim report on the effects of the government's ICT initiative, OfSTED commented that the CPD programmes had contributed "only rarely to the pedagogic expertise to help them [teachers] make the most effective use of ICT in their lessons" (OfSTED, 2001b, p4). In the past, such failures of new technologies in education had been blamed on the teachers' inability to adapt the new technologies to his or her teaching style (Cuban, 1993). Now another dimension was being raised, one that looked more closely at the individual and considered that there was an emotional aspect to be considered when leading CPD courses for a new initiative.

2.6 Continued Professional Development Programme Design

The design of such CPD programmes is therefore of paramount importance. As Akbaba and Kurubacak (1998) point out, it is important that educational leaders and CPD providers understand teachers' attitudes towards technology before they attempt to integrate such new initiatives into the classroom. A multi-million pound UK government programme - 'NOF Training' - highlighted how crucial this understanding was to effective implementation of ICT.

The New Opportunities Funding (NOF – named after its source of charitable funding), a major government ICT diffusion initiative that ran for three years from 1999, listed 47 approaches to ICT teacher training. The specification of the NOF training programme underpinned all of the ICT

training and was outlined in the 'Red Folder' (NGfL, 2000). There were 46 Expected Outcomes of the training, listed under the following five headings:

- A. Working effectively with ICT in teaching and learning
- B. Evaluating and selecting ICT resources
- C. Monitoring, evaluating and assessing teaching and learning
- D. Developing ICT capabilities
- E. Technical skills and applications

However, although all of the providers had to match their programmes to the 46 Expected Outcomes in order to be included in the programme and were thus restricted to some extent in what CPD provision style they could offer, a scan through this list of approved ICT CPD providers supports the basis for OfSTED's conclusions regarding lack of understanding by the specification writers for the needs of the teachers (OfSTED 2001b, 2002c); indeed, "teachers who themselves undertook courses to become NOF trainers criticised the NOF approach as over-prescriptive and insensitive to the needs of their own school" (BECTA, 2001 p15).

Apart from two providers, all of the programmes relied on the teacher to work by her or himself to introduce the new initiative. Of the two providers which did not use this approach, one did not even have its programme operational despite being listed in the file for over two years, while the other was an acceptable provider to only a small number of local education authorities. Such an approach had led school CPD coordinators to a situation where they had no choice in who would be the CPD provider. They were forced to take on board providers whose methodology did not fit in with the

teachers' needs but nonetheless have to be used, as other ICT funding was dependent upon participation in such training.

Many CPD programmes are designed primarily to introduce a change in method or content for a subject, to act as a means for teachers to learn new skills to use back in the classroom. Such change, according to West-Burnham and O'Sullivan (1998, p45) "is fundamentally about learning".

Andragogy, a theory of learning as applied to adults, is identified by Tennant (1997, p140-141) as having eight characteristics, one of which is "identifying the historical and cultural locatedness of experiences". Experiences such as these should be explored further to discover what will help the teachers overcome any 'emotional baggage' they have attached to ICT, and to offer supportive conditions to make this happen.

Given that the DfES' wording should include such an emotive word as 'confidence' when considering teachers' attitude to ICT, and in order to consider, in more detail, what this may involve in designing CPD programmes, a need arises to have a form of definition of 'emotion' in order to consider how we can incorporate such a dimension into these courses.

2. 7 Emotions and Emotional Intelligence - Towards An Operational Definition

Over the years, researchers, such as those highlighted in Sutton and Wheatley's study (2003), have created many definitions of 'emotions' but for the purpose of this thesis, consideration will be given more to trying to arrive at an operational definition of emotions in relation to teachers' 'ICT anxiety'

– fear or apprehension toward computers and computer use - and its subsequent effect on successful ICT diffusion. James-Lange theory of emotion proposes that emotions occur as a result of physiological reactions to events. According to this theory, you see an external stimulus that leads to a physiological reaction.

Fineman (1993, p1) talks about emotions being “within the texture of organising. They are intrinsic to social order and disorder [and] working structures. They are products of socialisation and manipulation". Damasio (1994) discusses emotions in the way that they guide the decisions we make in life. Authors such as Parkinson and Colman state that there are at least four ways of defining what emotion is:

Emotions imply a certain relationship between a person and some object (including the self) or event (real, remembered or imagined)...and they are evaluative, affective [and] intentional (Parkinson and Colman, 1995, p2/3).

Any study of emotions in relation to teachers' lives is made more difficult when consideration is also given to Huberman's (1995) or Fessler's (1995) research concerning how emotions change over the career life-cycle of a teacher. Such is the dynamic nature of these changes that, in these paradigms, teachers are recognised as having different dilemmas and experiences at various phases in their professional career and so their emotional responses to subjects will also alter. Not only is there, therefore, a range of definitions for emotions, but there is also a range of constantly changing environmental stimuli that affect these emotional responses, even at times when the subject is no longer considered a 'threat' (Damasio, 1994).

The range of psychological and philosophical ‘definitions’, even by those quoted in the small sample above, implies that there is no one universally accepted definition of emotions. However, most people, according to Parkinson and Colman (1995), have some intuitive understanding of it and recognise that emotions can be linked to a ‘particular history of ... reactions with the environment’ (Damasio, 1994, p113) and that they are often made up of what Goleman (1995, p 290) calls ‘families of emotions’, that is, a blend of anger, sadness, jealousy, fear, enjoyment and so on (see Ekman, 1992).

So, although a concise definition of emotions may not be possible, nonetheless we can consider an ‘operational definition’ that could be used for this thesis and that would account for teachers’ previous experience, task performance, social embarrassment (Bradley & Russell, 1997), fear of the hardware, and fear of making errors (Rosen & Weil, 1995). Such a possible operational definition gave Goleman (1995) the basis for his book on Emotional Intelligence (EQ).

EQ is based on the work of Salovey and Mayer (1990) who coined the term “emotional intelligence” to describe the ability to monitor others’ emotions, to discriminate among them, and, more importantly in terms of initiative implementation, to use this information to guide thinking and action (Salovey and Mayer, 1990). They found in one study, for instance, that individuals who scored higher in the ability to perceive accurately, understand, and appraise others’ emotions were better able to build supportive organizational networks (Salovey, Bedell, Detweiler, and Mayer, 1999). This definition is practical and brings the concept of emotions out of the realm of psychology and into the realm of change management.

Goleman (1999) and Mayer *et al*, (1999) have argued, however, that by itself emotional intelligence only provides the bedrock for competencies that are emotional intelligences. Goleman has tried to represent this idea in an even more practical way by making a distinction between emotional intelligence and emotional competence. Emotional competence refers to the personal and social skills that could lead to the ability to recognize accurately what another person is feeling and enable one to develop a specific competency such as influence.

As has been mentioned previously, the rational approach dominated the management of teacher CPD for the Numeracy and Literacy initiatives. It is the link between emotions, emotional intelligence (the understanding of emotions and how they can be used to positively influence others) that leads us to re-consider this rationality and look more carefully at managing the development of others to include emotions.

2.8 The Management of Emotions in Continued Professional Development

Few books or articles on organisation actually talk about 'emotions' in teaching (see Hargreaves, 1998; Beatty, 2000). Although exploring the emotions is the exception in teacher development (see Salzberger-Wittenberg *et al*, 1983 for such an exception), nonetheless, some writers (Guskey and Huberman, 1995, p26) are not just beginning to explore the concept in more detail but are also raising the notion that ignoring the place of emotions on teaching "fails to appreciate its potential for positively or negatively affecting the quality of the classroom experience" (Day, 1999, p33).

Our emotional responses to learning can often be triggered by 'buttons' - all of us have experienced what Parkinson and Colman call "personal stressors" (1995, p86) which have affected the way we carry out a task or assignment. Lazarus (1991) suggests that we should not take part in any learning activity without first considering the emotional aspects which will then determine the quality and quantity of the learning. CPD trainers need 'to be open to the[se] realities of others' (Fullan, 2000a, p206) so that such problems being faced by those being trained in the implementation of the new initiatives (relating, for example, to previous experiences of failure or embarrassment at not being able to accomplish a task - see Woods, 1981 and Pollard, 1982) can be addressed. CPD trainers can only do this if they know, and understand, those experiences which may influence the individual's approach to the initiative in order to make them feel more confident.

Given these concepts, we can begin to understand that generic CPD, designed to facilitate learning at large (ie multiple schools) cohort level, could not possibly take account of all the individual emotions of the participants. The effectiveness of the presentation in producing a 'this is good for me' response from all the participants thus comes into question. If we also recognize, as Fineman (1993) does, that emotions are products of our experiences, then we can also hold that if the reluctant teachers can be encouraged to overcome emotional concerns, they can move forward in the implementation of the initiative planned for during the CPD course (see also Hargreaves, 1998).

Understanding what emotional responses teachers have to an initiative and being able to use this information to plan an CPD that will give the implementation of the programme a greater chance of success also requires some knowledge of how emotions and learning link together.

2.9 Emotions and Teachers' Learning – Fitting Them Together

Gardner (1983) proposed seven types of 'intelligence', one of which, *Interpersonal intelligence* is the ability to understand other people: their emotions; what motivates them to learn or do things, how they work and how to work cooperatively with them. Successful salespeople, politicians, teachers, doctors, and religious leaders are all likely to be individuals with high degrees of interpersonal intelligence. The link between emotions and learning has its roots in the concept of "social intelligence," first identified by Thorndike (Thorndike, 1920 p 228), who defined this concept as "the ability to understand and manage men and women, boys and girls." There are many references (eg Parkinson and Colman, 1995; Edwards, 1999; deCatanzaro, 1999; Riches, 1994) which deal with this link and the part it plays in managing learning. It is appropriate, then, to consider this link in relation to how CPD courses may be managed to increase the likelihood of successfully implementing a programme.

This idea of considering 'emotional intelligence' as part of a strategy for managing learning has been popularized by Daniel Goleman (1995 and 1998) who devised a basic guideline for teaching competences based on the term. 'Emotional intelligence', Goleman states, refers to the capacity for recognizing our own feelings and those of others, for motivating ourselves and for managing emotions well in ourselves and in our relationships and linking these to cognitive development (Goleman, 1998).

In this approach, Goleman highlights a number of important areas which focus on this link between emotions and development. The approach he suggests reinforces the idea that generic CPD courses are unlikely to be as effective as ones geared to smaller groups whose needs are being more

specifically addressed. Amongst the techniques which he advocates to be used by the CPD leader would be the need to recognize the individual's profile of strengths and limitations which should be assessed to identify what needs improving. Such assessment is performed not just on the understanding that recognition of a person's strengths and weaknesses carries an emotional charge but that people will learn to overcome emotional doubts when working with like-minded colleagues. So, even when initiatives have demonstrable merit, any CPD may be ineffectual if it does not address the real conditions of the teachers' workplace and teachers' emotional relationship to change in general - in effect, the 'total teacher'.

As it is the case in even the most innovative CPD programmes (Guskey and Huberman, 1995, p21), so it is in current ICT CPD, that what is missing is the investment of learning with personal emotion and meaning (Reagan *et al*, 2000, p105). In order to include this, the CPD provider and school must share knowledge and experiences to gain a better understanding of what is required. Such collaboration is essential for effective personal learning to occur (Fullan and Hargreaves, 1992b) and for the needs of the 'total teacher' to be addressed.

The role of a CPD provider in learning these needs of the audience to more effectively target the programme has already been mentioned. But we can also use such understanding as a tool for encouragement (Goleman, 1998, p142). If the provider is aware of the teachers' concerns for the subject, as shown by Goleman, above, then the provider should be able to use this background knowledge to devise the CPD to take into account what Kohn (cited in Edwards, 1999, p390) considers to be 'authentic motivation', building on the individual's strengths and managing the weaknesses through achievable challenges. After all, teachers are the ones who are ultimately

responsible for implementing change, so CPD should be relevant to teachers and directly address their specific needs and concerns (Hall and Loucks, 1978).

The particular needs that we think about are not in themselves important as much as what their ultimate goals or effects may be (Maslow, 1987). Maslow's needs' hierarchy has enabled us to consider a number of paradigms for managing learning – a key aspect in any CPD programme. Even though teachers are becoming change-orientated, the content of the change itself is not as important as are the reasons to take on board that change. Individuals create their own objections to such changes, and CPD leaders should then consider these objections within the individual teacher's own construct when designing an effective CPD course.

Although there is no definitive guide to effective CPD (West Burnham and O'Sullivan, 1998, p68cf), if CPD course developers should be considering ways of allowing teachers to raise their fears and beliefs without feeling inferior in any way, then this gives rise to a strong argument for some targeted school-based CPD following a generic session. Such a school-based follow-up will give the individual teacher the opportunity to raise their anxieties within a (generally) more tolerant atmosphere and have access to support from colleagues sharing the same concerns in the same school environment.

2.10 Continued Professional Development – Accounting for the Needs of the Teachers

In any move, therefore, away from generic 'recipe for all occasions' CPD towards school-based CPD linking initiatives to the individual needs of each teacher at a school, a number of factors need to be

considered: The needs, wants and aspirations of the teachers that are to be achieved; There has to be a greater recognition of the fact that the key to educational reform is to be aware of and to use the teachers' emotions in a positive way towards successful implementation of the innovation; What we use to enable the children to grow and develop enables teachers to grow and develop as well; The climate of the school affects how teachers perceive CPD; Leaders and followers should be able to raise each other's motivation; Although teachers should be encouraged to problem solve and make decisions based upon their emotions, they also need to be open to suggestions for coping with concerns; Such problem solving is enhanced when leaders and followers understand that different individuals act on different emotional backgrounds and that none of these backgrounds is inferior to any other.

Businesses and industry may successfully implement uniform approaches ('corporate strategy'), but reforms based on uniformity in the educational system often fail (Elmore and McLaughlin, 1988), though this is rarely acknowledged as far as the introduction of government initiatives are concerned! What needs to be considered are follow-up sessions, based in school, taking on board the individuality of the teachers so that the CPD facilitator can more specifically tailor the learning to the teachers.

In regards to the possible role of emotional responses in the provision of teachers' CPD, which therefore raises the emphasis on CPD designed for a particular school, we can see that there are three areas for consideration:

First, in recognising that most CPD programmes neglect the emotions of teaching, we should also be aware that problems can arise from exclusive emphasis on emotions when considering CPD programmes, so getting the balance right between the two is crucial; in addition, to make the CPD more effective for the individual we also have to understand that they will have an emotional response to any given topic or initiative and that this response may well change over the teacher's professional life cycle (Huberman, 1995, p193-224); And, finally, at whatever stage the teacher is at, there is a need to ensure that like-minded people with similar concerns (and who are also trying to make similar changes) are there "to provide support, help [and] comparison for emotional and behavioural responses and other assistance " (Gatchel, in Parkinson and Colman, 1995 p86).

In order to manage change, the trainers need to be aware of the emotional implications of such areas (as outlined above) as they are helping the teachers. By basing this training in school, there are a number of advantages. First, teachers' development must allow for the raising of fears and concerns along the lines of those outlined in the section on emotional confidence and ICT, something few teachers would be comfortable doing in a large, anonymous, peer group.

Secondly, there is a feeling of control over what is happening as the CPD will be based upon unique knowledge of the participants. Findings from research by such as Elmore and McLaughlin (1988) show that, implementation of a new initiative must be shaped and integrated in a way that best suits the particular needs of a school's staff.

Third, the CPD facilitator and the school's CPD coordinator will have explored and shared their knowledge. Finally, a team of colleagues allows for criticism /doubts to be aired in a constructive atmosphere (Day and Leitch, 2001, p29).

There are, however, some areas requiring caution. First, although the school-based approach gives teachers a greater sense of relevancy, it can also give rise to anxiety about becoming an active participant in the process (Schon, 1995, p300/303). Secondly, new initiatives may be felt to threaten existing interest and identities - but without consideration of such possible threats, according to Louis and Miles (1990), the initiative may well be considered inconsequential and marginalized by the teacher as having no immediate impact on themselves and the implementation may fail. Third, although change programmes are more successful when the change is gradual (Fullan and Hargreaves, 1992a), often there is not this luxury as initiatives are implemented at the same time as the training is taking place and fourthly, many schools with small enrolment numbers have restrictions on the availability of collaborative and 'down time' which would allow teachers to discuss implementation of initiatives with their colleagues.

Although provision for in-school CPD is now only limited by how much each school is willing to buy back into the LEA's (or other providers') advisory programme, there is not likely to be a whole scale move to school-based CPDs for national initiatives. The numbers would be just too large and the time frame too unrealistic. What schools can do, then, is have their leaders listen to their teachers to discover what emotional background they have for the subject; use some time resource to work with them in such areas as Performance Management or their own CPD programme as a follow-up to the generic one – an CPD that is designed by the staff, for the staff - and move forward in small

steps. Leaders need to be aware that when dealing with teachers' emotions, simple good arguments may not be enough to win over the reluctant teacher, they must have the ability to sense what other kinds of appeals will persuade them and that can only be done through an understanding of the total teacher. Once we have reached that understanding, perhaps, then, teachers will be able to take on board, with greater confidence, not just the ICT initiatives which are in place now, but the others which are bound to follow

In the long run, the current situation of providing batch-CPD courses is likely to continue for as long as there is a perceived need to have standardized results published, for we are still looking at the “most efficient, calculable, predictable and controllable process” (Ritzer, 1966) to meet those government targets, and that can't be done if trainers do not consider creating school-based follow-up sessions. With so little current research on the role emotions can play in CPD provision, further studies to consider why teachers have such emotional responses to ICT and how CPD providers can best address these concerns is needed. Heads and ICT coordinators need to be made more aware of the concept of ‘emotional intelligence’ and how best reluctant members of staff can be lead along the road of ICT competency and confidence.

2.11 ICT and Teachers – The Role of Continued Professional Development

Logically, the direct teaching of ICT skills that was adopted both by the UK Government for in service training (CPD), English teacher training institutions and by the majority of teacher training establishments worldwide should have assured ICT competency and confidence. Unfortunately, this was not the case. A number of studies concerning the amount of teachers' ICT use in teaching practice showed that personal expertise in the use of ICT does not increase the likelihood of ICT use

in the classroom (Cuckle *et al*, 2000; Baron *et al*, 1997; Wild, 1995; Dunn and Ridgway, 1994). Moreover, there are examples of teachers attempting to integrate ICT in their teaching practice, but their attempt was not at all satisfactory. To be more specific, it was observed that they did not make use of all the variety of the software that was included in their training and was required by the National Curriculum. Furthermore, even the limited range of software that they used was not employed properly (Williams *et al.*, 2000; Robertson, 1997; Stevenson, 1997a and 1997b). Teachers appeared to have had little understanding of the range of the uses of ICT in school and it seems that teacher training institutions had limited success in providing them with this understanding and with the skills that would enable them to make the most effective use of ICT in the classroom (Williams *et al*, 2000; Simpson *et al*, 1998; Becker, 1998).

This is also evident in the few studies carried out in UK. English teachers consistently indicate that they need more and better training on the ways that ICT can be used in teaching as well as on the management of the use ICT in the classroom (Charalambous and Karagiorgi, 2002; Makrakis, 1997) and they repeatedly point out the necessity for teacher training establishments to equip their graduates not only with the necessary ICT skills, but also with knowledge concerning the planning and the management of the use of ICT in the classroom for teaching and learning (Kiridis *et al*, 2006). Thus, for teacher training to play a key role in the future introduction of ICT in the English primary schools, it must make teachers competent in using ICT as a:

- teaching tool;
- personal tool; and a
- tool for the development of students' ICT literacy.

The objectives of the large-scale CPD NOF training initiative, which was organised by the DfES and was carried out for three years, were compatible with the remarks previously stated.

2.12 Authentic Change

Authentic change occurs when a teacher's or school's belief systems and core values concerning teaching and learning are modified. In order for authentic change to occur, teachers need the opportunity to learn new information, time to experiment with the new concept, and the opportunity to evaluate its effectiveness (Levy and Murnane, 2004; Richardson, 2003).

If the introduction of ICT in primary schools is to be successful, both initial and in-service teacher education (in addition to providing the necessary ICT related skills and theoretical knowledge), must focus on the teachers themselves, adapt ICT courses to teachers' professional needs, provide them with suitable experiences and paradigms, make them understand the usefulness of the new technologies for teaching and learning, and take into account their existing attitudes and perceptions (Lawson and Comber 1999; Cox *et al*, 1999a, 1999b).

By adopting this point of view, we can try to elucidate these perceptions and the attitudes of teachers concerning the introduction and employment of ICT in primary education and aim to contribute to the better planning and implementation of the Government's ICT training initiative as well as to provide insights for any other further training attempt.

Pre-service primary teachers learn technology integration strategies by working with and observing primary school teachers and students in the classroom. Abbott and Faris (2000) and Goldberg and Sherwood (1983) analysed pre-and post-course surveys of trainee elementary teachers enrolled in undergraduate courses who were required to undertake a number of ICT-based activities reflecting their learning with computers. (Abbott and Faris, 2000, p155). The surveys indicated that pre-service teachers had a more positive attitude toward computers after the course which the authors attributed to five consecutive fifty-minute technology modules given at the beginning of the semester, and to frequent use of technology in the completion of activities and assignments throughout the course.

Their findings imply the value of the following strategies for preparing new teachers to integrate technology for student learning:

- Technology applications should be integrated into pre-service teacher assignments and activities.
- Site-based practicum in an elementary school provides pre-service elementary teachers with experience using technology with students.
- Pre-service teachers benefit from learning in small groups of 8 to 12.
- Fifty-minute modules for technology instruction in a computer lab with a video projector addresses oral, visual, and kinaesthetic learning styles and enables the instructor to quickly respond to student needs.
- Proactive instructor support with pre-service teachers reflects commitment and a collegial relationship among faculty and students.

- Elements of the course that were problematic (e-mail connectivity issues and level of English proficiency among elementary school students) prepared pre-service teachers to acknowledge that "learning with technology is messy" (Abbott and Faris, 2000 p.159).

The idea of some form of guidance is essential for successful innovation of technology according to Zhao *et al* (2002) whose study identified eleven factors that could be divided among 3 interactive domains (context, innovation, teacher) for understanding the dynamics of successful technology integration within classrooms. The findings demonstrated that human infrastructure is an essential component of the context that can greatly affect the likelihood of success for a technology innovation. According to the authors,

...one aspect of the human infrastructure did stand out even in innovations that didn't experience problems. This aspect is the presence of what we call a "translator," a person who can help the teacher understand and use technologies for his or her own classroom needs (Zhao *et al.*, 2002 p27).

In addition to 'translators,' and a flexible, responsive technical staff, teachers need a supportive and informed administrative staff. Included in the supportive environment are institutionalized policies and procedures for staff and students related to hardware and software purchases, professional development, and access to computers and the Internet.

Observation of teachers in different school districts can be instructive. In the Tupelo Mississippi School District in the USA, teachers are encouraged to travel to other districts to gain new ideas about classroom practice. A teacher can recommend that a practice be adopted by the Tupelo District

and "the district will pay for the changes in that teacher's classroom." (Bruder, 1992, pp26-27, quoted in OTA, 1995, p81). The travel and implementation policy is explained by the Tupelo school superintendent:

You can't tell people how to do things; they have to experience it, and it has to make sense to them. So we provide [money] for any teacher in the district to go anywhere in America...to observe cutting edge educational practices. ...We don't require that they return to the district and change anything, but what's happening is that they are seeing other, new ways of teaching (Bruder, 1992, pp26-27, quoted in OTA, 1995, p81).

Teachers also raise the issue of resources. They believe that the mere existence of ICT in a small minority of public primary schools creates inequity problems. In addition, teachers agree that the absence of ICT from the majority of households engenders this inequality. Furthermore, literature suggests that limited resources are a great impediment to the successful utilisation of ICT for teaching and learning. This lack of computers seriously limited what teachers and pupils could do in the classroom, which in turn resulted in lack of sufficient ICT experiences for both teachers and pupils (Rosen and Weil, 1995; Dupagne and Krendl, 1992; Hadley and Sheingold, 1993; Winnans and Brown, 1992). Case studies reflecting successful ICT exploitation for educational purposes have shown that it is more than necessary for schools to be provided with excellent facilities, technical support, and financial resources (Youngman and Harrison, 1998; Persichitte and Bauer, 1996). Therefore, the lack of sufficient computers in many primary schools seems to be wisely depicted as another vital problem, which must be dealt with before any other decision is taken.

By looking at how the individuals approached ICT diffusion, we can try to identify any patterns between the teachers in this study's cohort, but in the introduction of any new initiative, the whole field of innovation and change needs to be considered; we need to understand not just the needs of the individuals but also their organizations and their ability to change. The work of such writers as Stacey (2000), Brown and Eisenhardt (1998), Senge (1992) and Pascale, 1990 give useful insights as to how to transfer ideas of what works in industry to what could work in education.

In terms of the different aspects of the change process, Fullan's work, (eg, 2000 a and b; 1992b; 1991), is particularly valuable, as, in addition to a breadth of research into all aspects of educational change, it was the main body of literature which drew extensively on the ideas developed in the context of business, and considered what the implication was for education.

Many approaches have been drafted to facilitate the integration of ICT into teaching (Beyerbach *et al*, 2001; Gillingham and Topper, 1999; Howland and Wedman, 2004; Johnson-Gentile *et al*, 2000; Pierson and McNeil, 2000; Seels *et al*, 2003; Strudler *et al*, 2003; Thompson *et al*, 2003; Wright *et al*, 2002). Ellsworth (2000), draws together some of these in order to present a more coherent "road map" picture to the literature on change viewed from multiple perspectives. In his work, he uses an overview of the Concerns Based Adoption Model (CBAM) (Hord *et al*, 1987), which put forward detailed models of the change process from the point of view of both users and managers, set in a school focused context. In addition to this, the work of Rogers (1995) who studied the characteristics by which change is implemented was considered, as was that of Zaltman and Duncan (1977) and their work on resistance to change, the stages of the change process presented by Havelock and

Zlotoslov (1995) and the conditions which facilitate the implementation of educational technology (Ely, 1990).

Teacher change is defined as a highly personal process accomplished by the individual through experiences, emotions, cognitions, and behaviours over a period of time which transform a teacher's values and beliefs (Treacy *et al*, 2002; Prochaska *et al*, 1993). This process of change assumes the teacher recognizes a need, makes plans to improve, engages in the improvement, and allows time to evaluate the effectiveness of the new practices.

Finally, according to the research findings, the majority of the teachers realize the potential and the importance of ICT for teaching and learning, although they lack the necessary knowledge. At the same time, they do not believe that ICT will downgrade or restrain their role within schools. This is contrary to the results of earlier studies, where teachers--lacking the necessary skills--appear to have little understanding of their role within "ICT schools" as well as of the range of the uses of ICT in school (Williams *et al*, 2000; Stevenson, 1997a and 1997b; McKinsey and Company, 1997; Bikos, 1995; Dunn and Ridgway, 1994). Thus, taking into account their existing attitudes and perceptions (Cox *et al*, 1999a, 1999b), ICT training must now provide them with the suitable practical experiences and paradigms, to make them fully understand the new role that they are called upon to play in the classroom and within the learning process, as well as the great variety of the possible uses of new technologies for teaching and learning (Lawson and Comber, 1999).

However, a recent research project concerning the ICT training that takes place in teacher training establishments showed that ICT courses still persist on the development of student-teachers' basic

technical skills, while at the same time they seem to overlook the educational aspects of the use of ICT in the classroom (Kiridis *et al*, 2006). It is noteworthy that only a minimal number of studies regarding teachers' ICT training needs have been carried out in UK. Thus, the initial and in-service ICT training that is offered so far to English teachers largely ignores their attitudes towards the use of ICT for educational purposes, perhaps jeopardising the whole premise for authentic change in the classroom.

2.13 Using The Literature

The question posed by the literature is why an initiative that has been in operation for so long is not as embedded in the culture of the pedagogy as it should be? The literature provides some general answers looking at how the children learn, but there is little that looks at specific barriers which have prevented teachers from implementing the initiative more effectively (BECTA, 2007).

With the trend for the government and other bodies to emphasise research into the impact of ICT on children's learning, this study will instead consider, along similar lines to Condie, *et al* (2005) and Condie, *et al* (2007), another perceived barrier to effective diffusion of ICT - the personal characteristics of the teachers and specifically the concept of 'confidence'. Through a case study approach it is hoped that, as suggested by Stake (2005), by examining a particular case, it will provide an "insight into an issue to [enable us] to redraw a generalisation" (Stake, 2005, p 445).

CHAPTER 3 METHODOLOGY

3.1 Background

There was a growing concern that the government's ICT initiative, unlike the National Literacy and Numeracy Strategies (OfSTED, 2002a; OfSTED 2002b), was floundering, that the millions of pounds being spent was not being effective in integrating ICT into the students' learning (OfSTED, 2002c).

From working within the case study school, this was becoming more evident. Some members of the small cohort of teachers had been there many years, others were newly arrived. Some had developed as teachers through all the initiatives over thirty years and had marvelled at the use of coloured 'banda' masters to reproduce multi-coloured worksheets and were still happy to physically cut and glue their pictures to worksheets to make them more attractive, while others had been trained in the use of 'BBC' computers and still others had graduated with training in the use of the web and emails. None had been trained in the latest initiative of the interactive whiteboards. The constant themes of 'concern' and 'confidence' were being raised at each staff meeting as ways of embracing the new initiative ICT were discussed. This seemed an ideal opportunity to research what areas were causing most concern.

According to Rogers (2003), new initiatives are promoted by change agents, are picked up by early adopters, rejected by resistors, and succeed or fail depending upon the coincidence of a large number of influences or factors. Any such new educational initiative requires a plethora of follow-up data to assess the effectiveness of the innovation; the cost of this investment needs to be justified by

evidence from research supporting improvements in both the quality of teaching and learning and levels of attainment. Reynolds *et al* (2003) categorise the various groups that need this data into three – research evidence, optimist rhetoric and pessimist rhetoric.

According to Reynolds *et al* (2003), the optimist rhetorics are the influencers behind the initiatives such as the government – they need data feedback to show that the ICT diffusion has worked on an academic achievement and school improvement level. The academic researchers attempt to determine the effects of ICT diffusion on teaching and learning by attempting to correlate research on diffusion with increase in student learning. The third group of data collectors, the pessimist rhetorics, are likely to be the teachers who are also what Evans (2003) call the ‘late majority’, the ones in the classroom who cite the lack of research evidence supporting the innovation as reason for non-adoption of the initiative. Each of these groups uses the data in different ways. The Headteacher implementing ICT CPD, needs to be aware of these various factions during what Rogers (2003) calls the ‘innovation-decision process’ – the process through which the innovation implementers pass from gaining initial knowledge of the initiative to forming an attitude to the change, to making a decision to accept (or reject!) the innovation to implementation of the change.

In Condie *et al*’s (2007) research into studies of the effectiveness of different approaches to ICT training they found that because the sessions focused on developing technological skills and understanding rather than on the pedagogical approaches, they were largely unsuccessful (Beastall, 2006; Conlon, 2004; McCarney, 2004; Condie *et al*, 2005, Stark *et al* 2002; OfSTED, 2005) – the innovation-decision process failed.

Rather than repeat surveys, then, that would give variations on these statistics' theme of ICT integration, there was the possibility of taking a more personal, in-depth look at a school which was on the brink of embracing ICT across all areas of the curriculum. In this innovation-decision model, this was a very small sample that landed itself squarely in the quantitative research camp and, more specifically, in the strategy of case study research.

3.2 Why a Case Study?

Knezek and Christensen (2002) show that the biggest impact of ICT in education is shown in the way that teachers are increasingly using ICT as the medium of teaching.

In qualitative research, according to Maykut and Morehouse (1994; p18), "people's words and actions are used in order to understand the world under investigation." The use of words instead of just data allows the researcher to get a better feel of how people interpret the world. This approach could well be accredited to Malinowski (1922) who was one of the first researchers to take on 'indwelling' (Maykut and Morehouse, 1994, page 5) – getting into the community to understand them more. The technique was "to grasp the native point of view, his relation to his life, to realise his vision of his world" (Malinkowski, 1922, page 25). One way to do this according to many qualitative researchers (Stake, 1995; Yin, 1994; Maykut and Morehouse, 1994) is to use a 'case study' - gaining a more in-depth knowledge of a research question by going to the places where the research question can be addressed in a contemporary and real-life context.

The case study approach, as defined by Eisenhardt (1989), represents a strategy which focuses on the dynamics present within particular situations. Drawing heavily on the contributions of authors such as Glaser and Strauss (1967) and Yin (1984), Eisenhardt provides a framework for inducing theory from case study material, typically combining data from a number of parallel sources such as archives, interviews and questionnaires. The evidence thus generated is a combination of the quantitative and the qualitative.

The term ‘case study’, however, has a range of different meanings. Parlett and Hamilton (1977) looked at ‘illuminative evaluation’ aiming ‘to discover and document what it is like to be participating in the scheme’ (p10); Stenhouse (1988) identified four types (ethnographic, evaluative, educational and action research); Robert Yin, a leading exponent of the use of a case study, opts for ‘exploratory’, ‘explanatory’ and ‘descriptive’ and defines them in technical terms (Yin, 1994, p13) while Stake (1995) considers the qualitative approach to the study of a ‘particularity’ (Stake, 1995, p xi), distinguishing between intrinsic and instrumental case studies (Stake, 1995, p3). Whatever the definitions used (and there may well be an argument that many overlap – see Bassey, 2004), the use of case studies is not without its critics (Atkinson and Delamont, 1985, Walker, 1983).

One of the main arguments against the use of a case study is in justifying a generalization from a sample of one. Yin, himself, raises others’ opposition to case studies on the basis of ‘lack of rigour’ (Yin, 1994, p9) or being able to ‘provide little basis for scientific generalisation’ (Yin, 1994, p10). Two other detractors, Atkinson and Delamont, argue that this approach to research was ‘profoundly mistaken’ (1985, p38) while Walker (1983), although highlighting the problems of case study, also drew attention to these problems to minimize the concerns.

Despite these arguments, an essential feature of a case study is that it is to help improve educational practice, is conducted in its natural context, giving the opportunity for any significant features of the case to be explored and allowing the researcher to put forward an interpretation; it can be used to infer a possible next direction even if the method of generalisation does not follow that as used by standard surveys (Yin, 1994, p 31). Under these conditions, what Yin (1994) calls ‘analytic generalisation’ is acceptable. This type of generalisation is concerned more with the interaction of factors and events – ‘sometimes it is only by taking a practical instance that we can obtain a full picture’ (Nisbet and Watts, 1980, p5). A good study may not necessarily lead to a new generalization but, according to Stake (1993, p8) is likely to add credence to existing generalisations. Although there are many researchers who adhere to this approach (Campbell, 1975; Flyvberg, 2001; Vaughan, 1992) as being acceptable provided that due process is given to the emphasis on interpretation, such generalisations, according to Stake (1993, p12) should always be made with a *caveat* stating its limitations as the data is interpreted.

Because case study research is not sampling research based on statistical analysis (Yin 1994, Stake 1995, Feagin *et al* 1991) selecting cases must be done so as to maximize what can be learned by comparing it with a particular theory - in this case that teachers’ confidence plays a significant part in the integration of ICT into the curriculum and should be taken into account when planning teachers’ professional development - and inferring a generalisation. So, although the field research was the main focus of this study, consideration of the whole field of change and innovation also informed this research. In particular the works of Fullan (1991, 2000, 2000a), Fullan and Hargreaves (1992, 1992a), MacGilchrist and Buttress (2005) and Robinson (1997) from within education while Drucker (1986) and Rogers (2003) from the world of business were especially valuable in drawing together

the conclusions and their implications for future teacher Continued Professional Development (CPD).

A degree of commonality (Stake, 2005, p455) with other case studies in the area allows better understanding of why this approach was adopted for this research.

3.3 The use of case studies in ICT research

The choice of whether to adopt a quantitative, qualitative or combined approach to a particular piece of research is often dictated by the subject and the research sample (Benbasit *et al*, 1984, pp47-85).

There are a number of examples of the use of case methodology in ICT literature. The Second Instructional Technology in Education Study (SITES) is a series of 174 qualitative case studies that identify innovative practice in ICT (Kozma and Anderson, 2002). Using Stake's (1995) instrumental approach to case study research, SITES focused 'not on the uniqueness of the cases but on what can be learned from them'. This approach has also been used in the Impact study, one of the most comprehensive investigations into the impact of ICT on attainment so far conducted in the UK (Harrison, *et al*, 2002).

In each of these cases, the topic could not be studied outside its natural environment, they were contemporary issues and they did not have an established theoretical base (Benbasat *et al*, 1987) making them highly suited for a case study methodology. However, for a single researcher, their sheer size and scope placed their approach somewhat out of the range of this study. Other examples, however, are usable and doable on a smaller scale and it is on these that this study relied. To gain an

understanding of the nature of small scale case study research three samples are used to show the methodology that guided the approach to this study.

3.3.1 Sample 1- Interpretive Case Study

Tearle (2003) used 'interpretive case study research' with a staff of eighty in a UK secondary school to examine the process and factors which may have been influential in implementing ICT. Tearle's research had to be carried out in a natural setting since interviews and classroom observations were needed to trace the development of ICT in the school. What emerged from this research is "not an argument as to whether equipment, support or training is the more important, but much broader debate about mindsets, assumptions, beliefs and values of individuals and organizations" (Tearle, 2003, p581).

The paper gives details of the chronology and type of data collected - questionnaires, interviews, and observations. However, although it talked about the multiple-choice questions, examples were not evident in the paper. Despite this, the advantages of the multi-method approach were clear in regards to triangulation and validation. Tearle, herself, stated that, although some previous research on the topic had existed and that her multi-method approach added to the knowledge on the subject, there were still many more areas to be researched in detail (Tearle, 2003, p579) - particularly the area of the 'individual attitudes of the workforce' (Tearle, 2003 p579).

3.3.2 Sample 2 - Attitude to ICT – Using A Questionnaire

Christensen (2002) used previous work on how 'teachers' attitudes are an important element in teaching young people about computers' (p412) to research sixty teachers in an elementary school in north Texas, USA.

Using a needs-based instruction course in the integration of ICT based on a preliminary questionnaire, the use of a 16-factor Teachers' Attitude Towards Computers questionnaire (TAC), a skills checklist and a 'stages of adoption' form allowed this comparative case study to address the effects of a bespoke training course on ICT integration. As part of the research, two additional schools (who did not receive the needs-based training) were used as 'controls' over the same year.

Christensen posited three hypotheses that she wished to research: that needs-based training fosters teachers' positive attitudes towards technology; that this needs-based training combined with significant classroom use foster positive students' attitude towards technology and that positive teachers' attitudes towards ICT fosters students' positive attitudes towards ICT. The data analysis was detailed using standardised regression coefficients to analyse links and frequency distributions to determine minimum amounts of classroom use to be effective.

Rather than include all the TAC constructs and the stages of adoption questionnaire, Christensen makes them available on online. This was a good approach as it allowed for further scrutiny without taking anything away from the message of this case research.

3.3.3 Sample 3 – Research Using Mindmaps To Conceptualise Thinking

Although Mavers *et al*'s study, "Mapping Learning Potential: students' conceptions of ICT in their world" (Mavers *et al*, 2002) is not a case study, *per se*, it is a commentary on an aspect of a large scale case research - the ImpactT2 project (Harrison *et al*, 2002) in which the authors were involved.

ImpactT2 was set up to identify the effect of technology in and out of school, to determine if there was a correlation between the use of ICT and educational attainment and to consider areas that would assist future policy formation. Materials and formats for data gathering were developed for 60 primary and secondary schools, and the study had a major impact (sic) on the way ICT was considered to affect educational attainment.

There were a number of intriguing aspects to this case research that has implications for action-research. First, in each school, a teacher-researcher led the work, supported by a university team. Second, pupil-researchers worked with the teacher-researchers in the data-gathering process. However, it is a third aspect, the use of mind maps to help the students conceptualise their thinking on the world and ICT (and its procedure that was developed to analyse the results) that is the mainstay of Mavers *et al*'s paper (2002) and an area that was adapted as part of the present thesis study.

The ImpactT2 case research used a mixed qualitative and quantitative methodology but the researchers were concerned that they may miss out on a crucial new learning experience that would not show up in the more traditional questionnaire or interview. Drawing on Vygotsky's idea of

'instrumental psychology' (Vygotsky, 1978, p 44), mind maps were used to assess students' learning. This approach is not new (Stoddart, *et al*, 2000; Rice *et al*, 1998; Barenholz and Tamir, 1992; Markham *et al*, 1994), but this essentially diagrammatic approach enabled the students to effectively communicate information to the researchers.

3.4 Triangulation and Reliability.

As with any research, the methods and conclusions need to be justifiable. The issues of objectivity, reliability and validity are as relevant to qualitative research as to quantitative. Guba and Lincoln (2005, p207) highlighted their 'authenticity criteria' to ensure that the case study is credible - there is a need to determine if the evidence has been collected in a systematic and logical manner to ensure that it is both accurate and meaningful, that all stakeholders were given a fair voice, that the conclusions can be confirmed and an outline of the methodology can be used to interpret the evidence.

3.4.1 Triangulation

Case study is known as a triangulated research strategy. The need for triangulation arises from the ethical need to confirm the validity of the processes. Stake (1995) stated that the protocols that are used to ensure accuracy and alternative explanations are called triangulation, which, according to Denzin (1978 p291), is "the combination of methodologies in the study of the same phenomenon". Multiple and independent measures, if they reach the same conclusion, should provide a greater level of validation and lends greater support to the researcher's conclusions.

Snow and Anderson (1991) asserted that triangulation can occur with data, investigators, theories, and even methodologies. Hitchcock and Hughes (1993, pp104-105) cites diaries and use of other data such as questionnaires and interviews (Denzin, 1970; Cicourel and Jenings, 1974; Zimmerman and Weider, 1977) as other examples of the way in which this form of validation can be used.

Although this study did not follow the strict definition of triangulation set down by the likes of Elliott and Adelman (1976, p4) in that it should take its account 'from three distinct standpoints', in an attempt to assuage the criticisms outlined above, the approach using what Stacey (1969) called 'combined operations' and Douglas (1976) called 'mixed strategies' was adopted. Essentially, multiple-tools were used in this study to provide the reader with information from more than one type of information gathering approach- mind maps, interviews, observations and questionnaires.

3.4.2 Reliability

In terms of reliability, the criteria are such that if another researcher repeated the study, would the same results be obtained? Although this cannot be guaranteed in such areas as interviews (Kvale, 1996, p 65) and producing mind maps (Mavers *et al*, 2002, p189; Hitchcock and Hughes, 1993, p104), nonetheless, the additional data collection is able to lend itself to support the conclusion. This conclusion carries the *caveat*, as already discussed, that extrapolating a theory from a small sample case study could be problematic. This has been highlighted by Cunningham (2005) in her small-scale study (n=7), where she attempted to assess the viability of using mind maps to enhance students learning in biology only to find that one of the possible reasons for showing no correlation was the small sample. That is not to say that such results cannot be repeated, just that due recognition of the limits be taken into account when considering reliability.

The issue of objectivity has been highlighted by a number of researchers.

"The basic issue [in objectivity] can be framed as one of relative neutrality and reasonable freedom from unacknowledged researcher biases – at the minimum explicitness about inevitable biases that exist" (Miles and Huberman, 1984, 278).

Maykut and Morehouse (1994) also recognise that the use of this paradigm may cause problems. Although quantitative research's objectivity is "synonymous with good research" and the lack of obvious objectivity is seen as "sloppy" (Maykut and Morehouse, 1994, 19) and "unscientific" (Denzin 1970), nonetheless some researcher bias is still possible. Because of the way in which this researcher is considered part of the population being studied, there may be some 'response effect' (factors such as the tendency of the interviewer to seek out the answers that support his/her preconceived notions, eagerness of the respondent to please the interviewer or even vague antagonisms between the subject and interviewer (Borg, 1981, p 87)) and some consideration needs to be given to the researcher's positionality.

3.4.3 Recognition of Researcher's Positionality

The advantages and disadvantages of being an 'outsider' researcher (research conducted on a group by someone with no connection to the group) - or an 'insider' researcher (research conducted within a group by a member of that group) are well researched in a large volume of qualitative research literature among a wide range of areas from anthropology (Ohnuki-Tierney, 1984) through ethnic studies (Beoku-Betts, 1994) to research on families (Christensen and Dahl, 1997) and geography (Clark, 1998).

In this study, the writer was not only a teaching colleague of the participants but was also in a position of leadership as the head of school. As such the writer can be squarely categorised as an ‘insider’ – a “participant observer [who] gathers data by participating in the daily life of the group or organisation he studies” (Becker, 1998, p 652).

With such ‘rich’ data, the researcher had to consider his positionality with regards to two areas of possible bias:

1. The effect of his professional relationship as a leader upon the participants’ responses and
2. Maintaining objectivity and accuracy in the interpretation of the data being collected as the researcher had intimate background knowledge of the context.

As participant researchers we need to be reflective, but the researcher should not assume an ability to gain a completely objective and accurate picture of the insider’s community by simply, as Bulmer (1982) suggests, ‘stepping back’ from the study.

However, even if, according to research by Fontana and Frey (2005, p702), interviewer characteristics ‘have a relatively small impact on responses’, by being explicit about the writer’s position in the school’s hierarchy with regards to the participants (and making this visible to the reader as an area that has been considered when looking at reliability and bias) and by understanding the consequences of contextual knowledge and the professional relationship with the participants, it is still possible to place the interpretation of the qualitative data within the wider context of the research to give a reliable interpretation.

To this end, the researcher acknowledged that eliminating the impact of the researcher's relationship with the subjects would have been impossible given the size of the cohort and the researcher's role as the Headteacher. The approach taken by the researcher, then, was to acknowledge such a possible impact and adopt a relationship that highlighted this positionality with regards to 'all being in the same boat' in respect to ICT infusion; that this research would be covering an area that would be considered professionally non-threatening for the teachers but also that this research could also give an additional piece of information to be used to improve the provision for ICT professional development (in fact it did - because of the project, the researcher was able to argue for additional laptops under the 'Laptops for Teachers' initiative through the LEA to enable all the cohort to have their own, ahead of the normal 'roll out').

3.5 The Case Study School

The school selected was a small school of under 100 pupils with four full time members of staff. It was based in a rural setting with a wide farming catchment area. The school holds Investors in People, the Basics Skills Quality Mark and the Inclusion Quality Mark awards. Over the previous few years, the school had invested extensively in mobile laptops, wireless networking and interactive whiteboard technology. The teachers range in age from ones in their twenties to others in their late fifties. Apart from the teaching head, the three teachers (the ones who participated in this case study) were all females. While the teaching head had introduced similar projects into other schools and was a competent and confident IT user, each teacher came to the initiative with their own background. T1, for instance started her career in the IT department of a large national bank; T2 was a very experienced teacher, close to retirement while T3 was the youngest and the only one with some pre-service ICT training at university.

All but one of the teachers had their own laptops under the ‘Laptops for Teachers’ funding initiative; the school’s ICT equipment had all been purchased under the NGfL and ‘Interactive Whiteboards in the Classroom’ initiatives. A parent who owned his own ICT company had helped set up the wireless network. While day to day problems were dealt with by the teaching head, all other maintenance was carried out under the ‘buy back’ scheme through the LEA’s ICT support unit.

The children were taught in mixed age-classes, the teachers’ planning reflecting the wide range of differentiation required for such an approach.

3.6 Research Approach

A review of the approaches in the three case research examples cited above gave some of the parameters for the methodology of this study.

In this study, it was intended to show that an effective process for integrating ICT into the curriculum was multi-faceted, that one of the components was that of teachers’ confidence in their ICT skills and the equipment and to consider this aspect's effect on teacher integration training programmes. Rather than the assessment of teachers’ competence in the use of the technology, this case research focused on the attitudes of serving teachers following in-house and bespoke ICT training sessions as it attempts to grapple with the more sophisticated issue of ‘confidence’ and its effect on the successful integration of ICT into the classroom.

As the small population sample could not have produced reliable results from a response analysis questionnaire to allow for a “how many?” answer, adopting a qualitative approach allowed the researcher to look for a possible “why?” interpretation (Marton and Fai, 1999, p4). In considering the

areas outlined in Chapter 2, and guided by the research papers outlined above (to give what Stake, 2005, p455 calls 'commonality'), it was decided that the research approach should be based around the instrumental case study strategies outlined in the works of Yin (1993) and Stake (1995, 2005).

Instrumental case studies (Stake, 2005, p445) provide the opportunity to use a small population study sample and, with some *caveats*, propose a generalization. In a similar way to other case-study based projects such as SITES M2 (Kozma and Anderson, 2002), the focus of this case study was 'not on the uniqueness of a special case but on what can be taken away from it' (Stake, 2005, p390). The focus on the analysis was on underlying issues and causes that that may generalize beyond the case; illustrated in this study through the use of a visual metaphor (Eppler, 2003) to highlight a link between teacher confidence, pupil learning and curriculum integration of ICT.

Again, given that the study sample was small, it was felt that a range of different qualitative and quantitative approaches would be adopted to give possible further supportive data. These included a Likert questionnaire, construction of a graphical organiser (Novak, 1998; Buzan and Buzan, 2003), a narrative response questionnaire and pre- and post-lesson observation interviews.

3.7 The Research

Chronologically the initial questionnaires and mindmap activity were the first of the data collection tools administered. They were followed two years later by interviews with the teachers prior to observation of lessons into which ICT had been integrated, recordings of the children's conversations during these lessons and a post-lesson interview with the teacher. These methods provided the means and opportunity to gradually deepen and extend an understanding of the school and its

characteristics, of the way ICT was introduced and implemented, and the staff attitudes and practice in relation to ICT.

“Unlike with quantitative designs, few writers agree on a precise procedure for data collection, analysis and reporting of qualitative research” (Creswell, 1994, p 143). This is probably not surprising when there are 45 different types of research which Tesch (1990, p58) lists as falling under the heading of ‘qualitative’ research! In this study, four components were used: graphical organisers (mind maps), interviews, questionnaires and a free response 'personal viewpoint' narrative format.

3.7.1 The Use of Graphical Organisers.

In his article on the various types of graphical organisers, Eppler (2006) compared a range of these different multi-relational maps that foster knowledge sharing in a graphical form. These graphical organisers are structured around a main idea with some form of link identifying related concepts. These can range from Venn diagrams, through radar and spider charts to flow charts, visual metaphors and mind maps. In this section consideration will be given to the use of graphical organisers to communicate ideas.

The creation of graphical organisers supports the incorporation of new meanings into prior knowledge by making explicit visual connections as a way to integrate information into memory (Cañas, *et al* 2003). Although there are many approaches (Lawless *et al*, 1998; Stoddart *et al*, 2000; Somekh and Mavers, 2003), Kinchin and Hay (2000) identified three basic graphical organiser

structures - 'chain', 'net' and 'spoke'. The latter is often referred to as a 'mindmap' (Buzan and Buzan, 2003), which was the qualitative approach adopted for this task. Mind maps' strength lie in their ability to be easily taught to people to use, their ability to be personalised - to reveal the creator's perceptions rather than reproduction of facts (Jonassen, *et al*, 1997) and their ability to show a representation and organisation of ideas (Halford, 1993). This combination can be encapsulated in Wandersee's dictum 'to map is to know' (Wandersee, 1990, p923) and is a technique which is being more widely used in recording peoples' perception of a topic, it's background being rooted in the works of Ausubel (1968) and Vygotsky (1978).

In Ausubel's Assimilation Theory of meaningful verbal learning (Ausubel, 1968), the underlying basis is that, unlike rote learning, meaningful human learning occurs when new knowledge is consciously and purposively linked to an existing framework of prior knowledge in a non-arbitrary, substantive fashion. The foundations of this meaningful learning, bringing together the fragments of understanding, can also be found in the work of Vygotsky (1978). This approach suggests that tools play an integral part in 'anchoring conceptions' (Clement *et al*, 1989) and the use of graphical organisers aligns itself well with this approach.

Although Buzan's Mind maps (Buzan and Buzan, 2003) are probably the most well-known example of the 'nodal' graphical organizer approach, Novak (1998) developed this method of mapping understanding to help students understand their own learning.

From these studies the generally accepted view is that traditional evaluation tools (quizzes, tests, final grades) capture some aspects of conceptual structure, and mind maps capture other aspects; their main application is in their ability to offer an overview and, because they are not linear like an interview, they provide a useful additional perspective. In addition to the fact that the teachers in the case study school had recently been highlighting the use of mind maps with their students as a form of 'information giving', mind maps were chosen for this study not to evaluate the teacher's learning but to give a visual representation of how the teacher perceived the use of IT in her world on the day (Santhanam *et al*, 1998 and Harrison *et al*, 2002).

3.7.1.1 Communicating Potential Change – Visual Metaphors and Mindmapping

Kay (2006) identified at least ten strategies used to help teachers change to better integrate ICT into the curriculum, yet there is little mention of how that change is tracked. Mapping the change is of benefit to both the teacher and CPD facilitators who provide the training. It allows them to have some form of comparison to judge the effectiveness of the training approach. Although visual metaphor is one method that can be used, it is not perfect. Cooper in his 1997 article titled “The Myth of Metaphor”, considers that the search for a good visual metaphor is essentially counterproductive, while Toffler (1990, p6), stated that “even the most powerful metaphor, however, is capable of yielding only partial truth - no metaphor tells the story from all sides”. However, it can give a qualitative view of progress and there is certainly literature to support the concept that such an approach can improve knowledge management (Nonaka, 1991; Eppler, 2003) and Carlson (2001) found that preservice teachers who wrote metaphors with particularly meaningful ideas, accurately recalled details of them 18 months later.

3.7.1.2 Visual Metaphors

Visual metaphors are just another way in which knowledge can be shared. The visual metaphor can be defined as the representation of a new system by means of visual attributes corresponding to a different system, familiar to the user that behaves in a similar way (Dürsteler, 2002). An archetypical case is the map of the London underground railway system (the ‘Tube’).

Visual metaphors provide a dominant mode of information processing. Advertisements on television and in magazines are good examples of visual metaphors. Unfortunately, they are aimed at persuasion rather than at sharing relevant knowledge which is the purpose of the 3D model proposed in this study. The choice of a 3D visualisation over 2D was driven partly by novelty, but also through recognition of the difficulty of trying to represent the various aspects of the problem.

3.7.1.3 Constructivism and Communicating Ideas

Constructivism as suggested by Vygotsky (1986) proposes that, while there is a real world out there, there is no meaning inherent in it; that knowledge is created rather than discovered. As a set of instructional practices, constructivism favours processes over end products; guided discovery over expository learning; authentic, embedded learning situations over abstracted, artificial ones; portfolio assessments over multiple-choice exams, etc. Vygotsky strongly believed that articulating thoughts was an effective method to process connected or random thoughts in a conscious way to raise the awareness of mental activity and thus create logic and meaning not just for oneself, but also for others – “a thought may be compared to a cloud shedding a shower of words” (Vygotsky 1986 p 251). In order to aid this, this research used both interviews and concept maps as a visualization

format to aid the teachers to communicate their thoughts on their current attitude and usage of ICT and to further help gain an insight as to the effect of emotion on meaningful learning.

The interplay between feeling (affect) and meaningful learning is a major proposal of this research. Ausubel relates that “the most important single factor influencing learning is what the learner already knows” (Ausubel 1968, p iv), it is related to an existing link in an individual’s knowledge structure. One way of demonstrating this is through the use of what Novak (1998) calls ‘concept maps’ (later popularised by Tony and Barry Buzan (2003) who copyrighted the term ‘Mindmap’).

3.7.1.4 Concept maps

A concept map is basically a diagram used to show understanding of links between concepts in a topic. Each node (identified concept) is connected by lines to either each other to show relationships or to a common theme to show link to the common concept. Stoddart *et al* (2000, p1223) summarizes them thus: 'Concept maps have been demonstrated to be a powerful tool which assists students in clarifying their understandings and makes connections between concepts explicit'. A search through the literature shows the extent to which concept maps are being used to portray a mental model of the maker's ideas and perceptions. (Anderson and Huang, 1989; Harrison *et al*, 2002; Jegede *et al*, 1990; Lay-Dopyera and Beyerback, 1983; Lomask *et al*, 1992; Malone and Dekkers, 1984; Markham *et al*, 1994; Novak and Gowin, 1984; Novak and Musonda, 1991; Roth and Roychoudhury, 1992; Roth and Roychoudhury, 1993; Starr and Krajcik, 1990; Wallace and Mintzes, 1990; Willerman and Mac Harg, 1991).

From the work of Harrison *et al* (2002) on the use of mind maps, it can be seen that that they can help teachers visually understand the place of technology in the wider world and in their own world. Because not all information is linear, and mind maps are non-linear, it enables their creators to add to them, not just in different dimensions but also at different time points, potentially offering members of the cohort a dynamic and adaptable tool to show what they know.

3.7.1.5 Analysing Mind maps

There are many different approaches to analysing concept maps (Roberts, 1999; Novak and Gowin, 1984; Stoddard *et al*, 2000, Rice *et al*, 1998; McLay and Brown, 2003; Kinchin and Hay, 2000). Because they are generally focusing on factual knowledge on a topic rather than, as in the context of this study, emotional feelings about the topic, an alternative, hybrid, approach has been used.

The system adopted favoured the phenomenographic approach proposed by Marton (1994) and later used by Mavers *et al* (2002) in the ImpactT2 studies. Because it looks for trends in its open and multi-dimensional approach to interpreting the way that the respondents conceive IT in their world, this approach to interpreting the concept maps allows more of a focus on the understanding of the meaning events have for the person being studied (Patton, 1991).

3.7.2 The Use of Interviews

"Nowadays, few areas of research, teaching or scholarship remain untouched by developments in information technology" (Lee 2000, p 115). Perhaps the most spectacular developments have been in the area of analysis software, with the appearance and subsequent advances of packages permitting

researchers to organise and explore their research data in increasingly sophisticated ways (Fielding and Lee 1991). The interview, long used by qualitative researchers, is no exception.

"Interviews are an essential source of case study evidence because most case studies are about human affairs" (Yin, 1994, p85). The type of interview most commonly used in research is the structured one (Babbie, 1992, Bradburn *et al*, 1979, Gorden, 1980). In this type, the interviewer asks all respondents the same questions.

The use of interviews in ICT implementation research is well documented. See for example, Preston, *et al*, 2000, Selwyn, 1999 and Hoffman, 1996. The works of Tearle, 2003, Lloyd, 2003 and Lim and Hang, 2003 were of particular relevance as their interviewing was incorporated into a case study approach.

Approximately two years after the initial mindmap and questionnaire exercise, the teachers were observed during a lesson that was to use ICT – including the newly installed interactive whiteboards. A pre and post lesson focused interview was devised with an emphasis on what aspects of the use of ICT they used now which they would not have used previously. Unfortunately, only two of the original cohort of teachers was available for this follow-up, the third having retired. As this project was not reliant on a statistical analysis, this was not a major setback, but the extrapolation of any feedback from the specific to general was, by necessity, to be even more cautious than had originally been planned.

The interviews were structured around a small number of open-ended questions (see appendix) designed to elicit an unrestricted response and were recorded (with permission from the subjects). The lessons were not specially set up for the observation. The only criteria were that the observation should take place during a lesson that was more likely to lend itself to the integration of ICT.

The interviews were informal, their main aim to have the teachers discuss what they had planned for during the lesson and how the use of ICT had impacted on the lesson. Further questions were added in the post-lesson interview to develop specific answers that were given in particular regarding how the teachers now felt about the use of ICT in comparison to two years previously.

In qualitative research using interviews, emphasis is placed on the importance of looking closely at people's words to see if any pattern emerges. Because the use of a structured interview may be considered at odds with the ethos of qualitative research, a semi-structured format was planned. This allowed the researcher to have some control over the topics discussed but allowed the respondents the freedom of open-ended answers. A semi-structured question interview approach along the lines suggested by Lincoln and Guba (1985) and Skager and Weinberg (1971) was thus used.

3.7.3 The Use Of A Questionnaire.

In order to help triangulate the results of the study, the main instrument for data collection was a survey instrument which consisted of a cover letter and the instrument survey. Such questionnaires have been used extensively in researching ICT implementation from large scale, world-wide surveys (Pelgrum, 2001) to small focused groups Makrakis (1997). Specifically, the research highlighting

the barriers to ICT integration covered by Christensen (2002) and Tearle (2003) gave this study some of its structure.

A questionnaire was issued to all the teachers and was designed to find out if there was a link between the teachers' confidence level and which programmes/utilities were used and to gain some data on teachers' personal perceptions. The results would help to gain deeper insight into understanding the existence of a link between confidence and ICT integration.

The questionnaire used in this study, incorporated eleven scales presented in either a four or five response, Likert-type scale and was developed from scales used in the Teacher Attitudes Questionnaire (TAC), developed by Christensen and Knezek (1998) and from the research carried out by Cox *et al* (1999a and 1999b). The domains these scales measured included: School ICT environment ($n= 1$); Ease of ICT implementation ($n= 1$); Confidence and competence ($n=2$); Usage content ($n= 17$); Internet subscriptions ($n= 4$); Software usage ($n= 71$); Patterns of usage ($n= 28$); Internet usage ($n= 14$); Support ($n= 22$) and Personal perceptions ($n=39$).

Following the recommended procedure for manual scoring (Knezek and Christensen, 1997), the numeric values of the responses were entered into an electronic spreadsheet simply summed for the related items to produce the various category scores and data graphs.

3.7.4 Narrative Responses

Using open-ended narrative enabled the respondents to give their feelings about their use of ICT and was considered an additional method of providing more in-depth data. This was similar to the approach adopted by Watson (1997) and Summers (1988, 1990).

Although it was 'open', the narrative 'Personal Viewpoint' had six guideline domains:

'The most positive and negative outcomes of using IT for you?'

'How has the use of computers and IT changed?'

'What major problems were encountered and how were they handled?'

'What recommendations could be made about introducing laptops for staff use into school?'

and

'Plans for future use of laptops and software?'

A coding framework was then devised to compare the responses using an 'open coding' method (Strauss and Corbin, 1990). The responses were grouped into five main categories:

equipment,
organisation,
classroom practice
self-worth
training

Sub categories of "positive" and "negative" were applied within each category. The categories used in the analysis which arose from this 'open coding' method have similarities with analytical

categories used in the studies of Blackmore *et al* (1992), Summers (1988, 1990), and Woodrow (1991).

3.7.5 Classroom Observations.

As part of the multiple-tool approach, lesson observations were also carried out to further determine the level of confidence for the use of ICT in the classroom on a day-to-day basis.

The use of observations as part of a range of ways of determining ICT integration was highlighted in such research as the large-scale SITES project (Pelgrum, 2001, and Kozma and Anderson, 2002) and has been placed in the forefront with the UK's DfES' e-strategy "Harnessing Technology" (DfES, 2005). In this project, all members of the teaching profession are action researchers, feeding back into the project through a number of different methods including classroom observations. Because the researchers are as likely to be teaching assistants as much as trained teacher, the approach to reporting the observations was done in any manner that was easy to show the way that ICT was being used.

Following a similar approach, children's conversations were recorded during lessons. Transcripts of these conversations (suitably anonymised and with parental permission given for their use in academic research) were made and a simple analysis of the conversations along those suggested by Travers (2001) was completed.

CHAPTER 4 ANALYSIS OF THE INDIVIDUAL CASE STUDIES' DATA

4.1 Introduction

In this study, data was collected through a variety of methods: unstructured and semi-structured interviewing, use of graphical organisers, and questionnaires. This triangulation across various techniques of data collection is particularly beneficial in theory generation, as it provides multiple perspectives on an issue and supplies more information on emerging concepts. (Eisenhardt, 1989; Glaser and Strauss, 1967; Pettigrew, 1988, Stake, 2005).

The iterative approach of data collection, coding, and analysis was relatively open-ended and generative focusing on the development of concepts, properties, and relations, and following an approach similar to the one set out by Glaser and Strauss (1967) and Eisenhardt (1989). The data generated was examined and coded using a form of content analysis where the data is read and categorized into concepts that are suggested by the data rather than imposed from outside (Agar, 1980). Known as “open coding” (Strauss and Corbin, 1990), it relies on an analytic technique of identifying possible categories and their properties. Once all the data was examined, the concepts were organized by recurring themes looking for connections between subcategories. This iterative examination yielded a set of broad categories that described a number of key conditions, events and experiences associated with the introduction of ICT in the case study school.

In order to ensure validity of the interpretations made (Miles and Huberman, 1984; Yin, 1994), emerging concepts were checked by examining them across the sample cohort using multiple methods. For example, participants' reports of the software they used in the classroom were checked

against the documentation available for planning. Triangulation across the data sources further served to strengthen the emerging concepts.

Numerous studies have shown that the hardware itself has a major impact – lack of it, reliability of it, understanding of it - on the successful implementation of ICT into the curriculum (Pelgrum, 2001; Lim and Hang, 2003). By considering what impact this has on the teachers themselves we can determine if we are missing something on the more personal level that determines how a teacher uses ICT. Studies such as IMPACT2 (Harrison, *et al*, 2002) and others (Tearle, 2003) have indicated that there are areas to be pursued here. The relationship between teachers and ICT is complex but by looking at individual cases we can hope to gain more insight into these relationships.

This exploratory case study is, in essence, looking at causes in non-implementation of change; specifically, consideration of how confidence and emotions have been factors not taken into account when considering CPD and the implementation of the ICT initiative.

Guskey's (2002) seminal work on evaluating CPD along with detailed case studies of teachers innovating with ICT (Zhao *et al*, 2002) gives us five levels to act as benchmarks – participants' reactions; participants' learning; organisational support and change; participants' use of new knowledge and skills and students' learning outcomes. The boundaries of this case study can be defined within the first level of participants' reaction by the hypothesis that teacher confidence plays a part in the integration of ICT into the classroom and should have more weighting when considering teacher CPD. This hypothesis may be examined by addressing four specific questions:

- What part does teacher confidence play in the integration of ICT into the classroom?
- What has an impact on this confidence?
- What implications does this have for continued professional development (CPD)?
- Can we model the case study into a proposal to help other teachers?

By exploring these four questions, it will allow us to make informed judgement about whether this small-cohort case study can be used to determine whether the proposition is correct or whether alternative set of explanations might be more relevant.

4.2 Layout of Chapter

As this study is basically three mini case studies, the chapter has been laid out thus:

4.3 The need for triangulation in this Case Study – the use of multiple response tools.

4.4 Overview of the analysis techniques for the survey tools used

4.5-4.7 Analysis of each of the cohort members' responses to these tools

4.3 The Need For Triangulation In This Case Study – the use of multiple response tools

Guba and Lincoln (2005, p212) stated that there was no single, conventional paradigm towards which researchers had to subscribe. Rather, that there should be more of a mixture of approaches. In what they term their 'guiding inquiry paradigm' (Guba and Lincoln, 2005, p 200) offered that, although qualitative approaches are often more appropriate for case study, there are arguments for the use of mixed methodologies and that the use of quantitative methods would also be appropriate.

In considering, also, the methods for data collection and analysis, the work in phenomenology (Marton, 1994) became influential. Given the small size of the cohort involved in this case study, there needed to be some form of triangulation if there was to be any support for a generalization. Glaser and Strauss' method was to use comparative analysis - "multiple comparison groups" (Glaser and Strauss, 1967, p7) - which allows for generation of a theory, regardless of the size of the social unit being analysed.

The triangulation method, being based around the approach used by navigators to pinpoint their position (anecdotally stated by Stake, 1995, p 109), is what many consider the most acceptable form of validation when carrying out a case study and is "the combination of methodologies in the study of the same phenomenon." (Denzin, 1978, p291) - a "between (or across) methods" approach (Denzin, 1978, p291). Because the cohort size was small (n=3) and statistical analysis was going to be difficult, in this study validation was addressed through the use of mindmapping, surveys and interviews.

4.4 Overview of the Analysis Techniques for the Survey Tools Used

I will now briefly review the methods utilised, before examining these methods in detail as applied to each teacher. Finally, I will conclude with an overview which links each analysis section together.

4.4.1 The Mind maps

From the three basic mindmap structures - 'chain', 'net' and 'spoke' identified by Kinchin and Hay (2000) - the latter, qualitative approach (and often referred to as a 'mindmap' (Buzan and Buzan,

2003) was adopted for this task; thus, the teachers were given simple instructions as to how they could construct their mindmap, “Computers and Me”. The openness and unstructured nature of the input was emphasised in contrast to the more formally laid out Likert scale questionnaire which accompanied the mapping task.

Mind maps are not the easiest of research tools to interpret and approaches to this have divided critics. Some researchers like Novak and Gowin (1984) suggest a very elaborate system, while another approach rates the maps against specific criteria such as outlined by Mason (1992) and Stuart (1985). White and Gunstone (1992) state that they should not be scored but, if they are, the decision as to which approach to adopt should follow their simple advice of choosing the one for 'the purpose for which the scores are wanted' (White and Gunstone, 1992, p3).

From the work of researchers such as Ruiz-Primo and Shavelston (1996), Kinchin (2000) and Klein *et al* (2001), Kinchin and Hay (2000), Roberts (1999), Novak and Gowin (1984), Stoddard *et al* (2000), Rice *et al* (1998), McLay and Brown (2003), Roberts (1999) and Mavers, Somekh and Restorick (2002), scoring methods and analysis of mind maps can be carried out in one of hundreds of permutations with a corresponding number of interpretations. As the majority of this research was showing links to understanding of factual content rather than graphical representation of feelings, the scoring method adopted drew on the works of McLay and Brown (2003), Roberts (1999) and Mavers *et al*, (2002). One of the difficulties facing the use of mind maps is to ensure fair scoring - the openness of the responses leads to uncertainty. No scoring for mind maps is perfect (Yin, *et al*, 2005), and thus I decided only to score key areas of relevance.

The first step, therefore, was to make an initial value judgement of the maps based on relevance to the guiding criteria given to the teachers and apparent clarity of the map. This gave a rough rank ordering from which future analysis continued. The next stage was to count the number of nodes (connections) on the maps. However, because the scoring methods outlined in the majority of the literature analysed understanding of knowledge, the analyses of these mind maps weighed various statements linked to the mindmap's theme of 'confidence, competence and Teacher's usage of ICT in the classroom'. See Figure 4.1 below (this will subsequently be analysed in further detail):

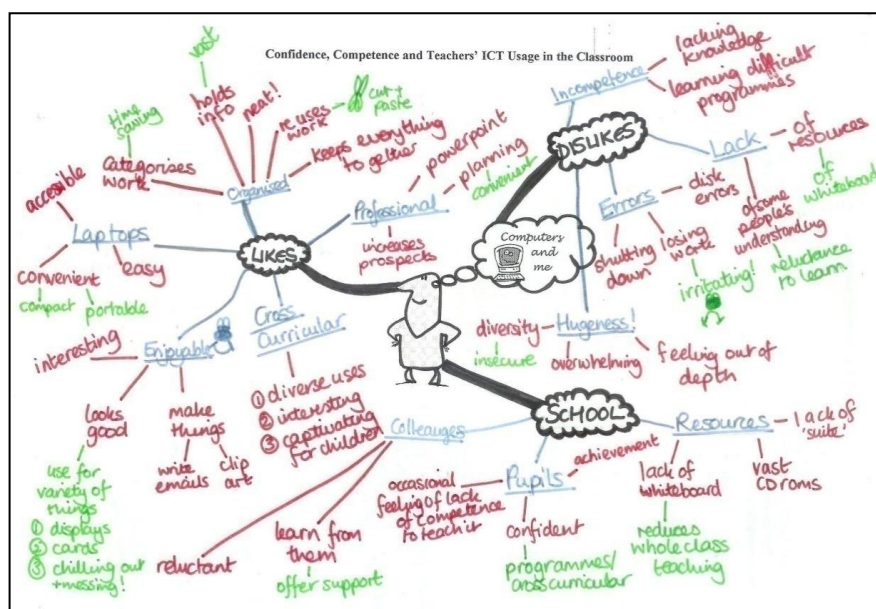


Figure 4.1 Mindmap from one of the teachers

The following terms, based on the author's expectations of what was likely to appear, were taken as top ranking in the coding (the '*expected list*' of words):

- Apprehension
- Competency
- Concern
- Confidence/ feeling of failure
- Difficulties
- Frustrating
- Reluctant/Resistant
- Unreliable

Using this list, a ranking points table was devised:

Area for ranking	Description	Ranking points
Terms appearing	Expected list plus others	5
	Expected list	4
	Expected list, less 1	3
	Expected list, less 2	2
	Expected list, less 5 or more	1
Nodes	Logical connections	4
	Connections not understandable	3
	Few examples given	2

Table 4.1 Mindmap ‘expected words’ ranking

How each teacher’s mindmap corresponded with these rankings will be evidenced later within each case-study.

4.4.2 Interpreting the Free Response Narratives

A semi-structured, free-response format, similar to that used in studies by Summers (1988, 1990) was used to elicit responses on six areas:

1. What have been the most positive and negative outcomes of using IT for you?
2. How has your use of IT and computers changed?
3. What major problems had you encountered and how were they handled?
4. What recommendations would you make about introducing laptops for staff use into schools?
5. What are your plans for future use of your laptops and software?
6. Please feel free to comment on any aspect of IT you consider important.

Although a suggestion was offered to use the back of the response sheet should it be required (and two of the teachers generally stayed within the guideline response boxes), one elected to take up the offer. Unfortunately that teacher did not specifically complete any of the above guiding questions.

The teachers' free-response messages' were coded using an 'open coding' method (Strauss and Corbin, 1990) in a similar method as used for the mindmap section. The responses were grouped into five main categories: equipment, organisation, classroom practice, self-worth and training. Sub categories of “positive” and “negative” were applied within each category. The categories used in this analysis which arose from the 'open coding' method have similarities with analytical categories used in the studies of Blackmore *et al* (1992), Summers (1988, 1990), and Woodrow (1991).

4.4.3 Questionnaire

All the respondents completed the questionnaire. There were 201 closed questions in ten sections: School ICT environment ($n= 1$); Ease of ICT implementation ($n= 1$); Confidence and competence ($n=2$); Usage content ($n= 17$); Internet subscriptions ($n= 4$); Software usage ($n= 71$); Patterns of usage ($n= 28$); Internet usage ($n= 14$); Support ($n= 22$) and Personal perceptions ($n=39$). All the items were presented with either 4 or 5 Likert-type response options for ease of coding. These categories are now briefly outlined, with additional reasons for their pertinence and thus inclusion.

School ICT Environment

In order to determine the level of effort the teachers felt the school was providing in integrating ICT, the responses were categorised within the range of 'in some subjects'.

Ease of implementation of ICT

As with any new initiative, how well it is implemented and how well it is accepted will depend upon the resources being given to support its introduction.

Confidence and Competence levels

Much of the literature discussing integration of ICT refers to reasons why the integration has not been successful (Pelgrum, 2001). The amount of confidence a teacher has with regards to the technology may greatly influence how effectively ICT is integrated (Christensen, 2002) and the results in this study are similar to research by Becker (1998) who found that, at any level, the number of teachers strong in most aspects of computer use is small (5% of elementary school teachers). With the comment made during the interviews about still needing more training, the link between competence and confidence is crucial for successful implementation of ICT (Kirkwood *et al*, 2000), as will be seen in greater detail later in this chapter.

Software Usage

Findings from research (Niederhauser and Stoddart, 2001) indicate that views about effective computer-based pedagogy are related to the types of software teachers report using with their students. The list of software included in this survey was for those currently available in the sample school. The titles were then categorised according to the genre, in order to give feedback on the areas of the curriculum that were most actively supported. The genre was used in order to acknowledge the findings of other research (Becker, 1998 and 2000), where it has been found that teachers who use ICT effectively tend to have students use computers in varied and complicated ways.

Personal perceptions

The processing of emotional information, according to Mayer (2001) begins with its accurate perception. With this perception comes 'emotional integration' (Mayer, 2001), contributing to

awareness of how one's emotions are affecting these perceptions. Because it is difficult to determine the accuracy of a person's perceptions, the issue becomes less dependent on whether such perceptions were correct, but rather how they were shaped through the teacher's experiences. Indeed, perception, according to Lowe:

includes the subject as the perceiver, the act of perceiving, and the content of the perceived....The act of perceiving unites the subject with the perceived. And the content of the perceived, which results from that act, affect the subject's bearing in the world (Mayers,1982, p1).

Furthermore, this definition has proved most crucial to this research and is being used here to consider the 39 constructs of this section of the questionnaire. These constructs were divided into 5 sub-categories T+ teacher positive outcome; T- teacher negative outcome; S - effects on school; O- effects on others; L - effects on pupils' learning.

Software integration

There were 28 constructs under the heading 'Patterns of Usage'. Of these, four dealt specifically about how much the teachers felt that ICT was being integrated into various areas of school life.

Collaboration

Collaboration was viewed as vital for inclusion as it is a major part of any teacher's box of tools for self-development. (Mortimore, *et al*, 1994, Hopkins, 1996).

4.4.4 Interviews

Interview studies are often used to elicit participant's perceptions, but to what extent can it be appropriately presumed that people attach a single meaning to their experiences? Holstein and Gubrium (1995) raise the issue of whether to treat interview responses as constructed 'narratives' or as giving direct access to 'experiences'. In this study, the approach for the interview analysis incorporates a descriptive study based upon one aspect of the infusion of ICT into the curriculum.

The questions were the same for each respondent; though some areas were explored further to elicit more detailed responses. The responses were recorded, transcribed, and analysed for recurring thoughts or emergent themes (Kvale, 1996, chapter 11).

4.4.4.1 Coding the transcripts

Although the transcripts look fairly detailed, the importance in their interpretation is not linked to the exact wording but more to the meaning of what was said (Huberman and Miles, 2002). During the process of analysing, then, similar ideas, feelings, and experiences were noted.

Now the structure of the analysis has been presented and explicated, I will explore each case study separately: first the data will be recorded, with subsequent analysis. Finally, I will return to a comprehensive comparative analysis of all three in order to compound my findings.

4.5 Analysis of each of the cohort members' responses to these tools

4.5.1: Teacher 1

4.5.1.1 The Mindmap

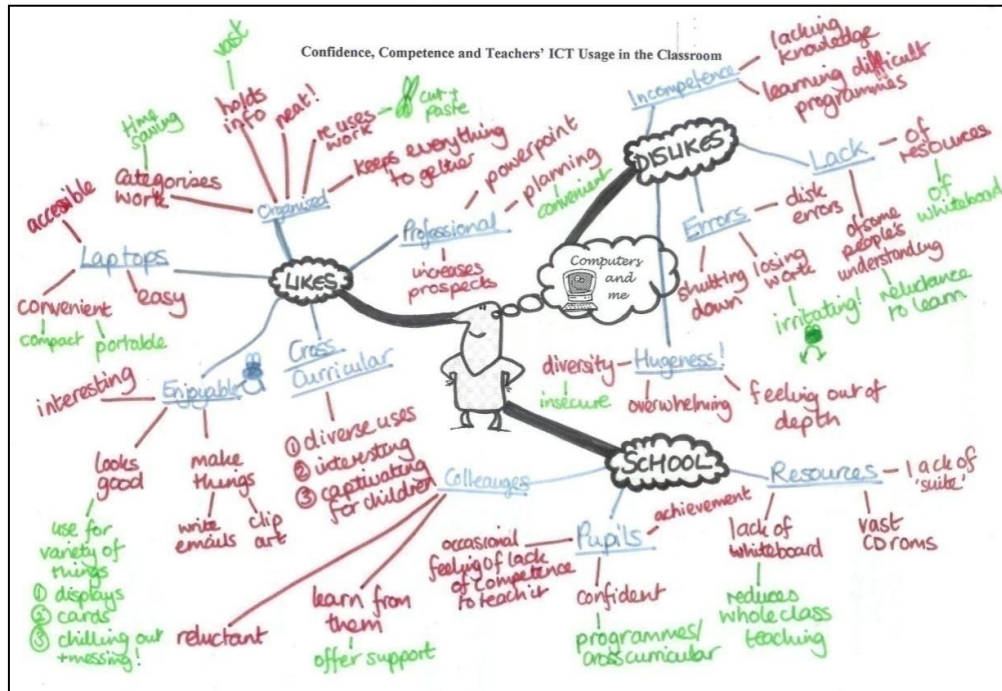


Figure 4.2 T1 Mindmap

Here, again, is the ranking system used to codify the mindmap:

Area for ranking	Description	Ranking points
Terms appearing	Expected list plus others	5
	Expected list	4
	Expected list, less 1	3
	Expected list, less 2	2
	Expected list, less 5 or more	1
Nodes	Logical connections	4
	Connections not understandable	3
	Few examples given	2

Table 4.2 Mindmap 'expected words' ranking points

Thus, Teacher 1's mindmap was codified as below:

Rank ordering :	T1MM
Number nodes:	64
Ranking points - terms:	2
Ranking points - Nodes:	4

Table 4.3 results of analysis of Teacher 1's mindmap.

The cohort sample was small and so any patterns could only be suggestive at the most, rather than conclusive. The researcher's expectation was that the number of nodes would reflect the number of comments about the areas of concern. Surprisingly, scores from initial rank ordering were inversely proportional to the rank ordering on the mind maps' contents.

It was T1 who drew in the most nodes linked to the theme, and also T1 that produced a mindmap that showed the least number of negative comments and thus the most positive approach. The free approach to what can be included was insightful in that the respondents' descriptors for each of the nodes gave a good indication of the creator's inner feelings towards the topic.

The expected activity system contradiction was not highly evident across the cohort. The mind maps would appear to show more that the level of enthusiasm for the use of IT is reflected in the number of terms used to show how IT was being used rather than the number of negative terms to show concerns for IT integration. T1, one of the more IT literate teachers scored higher in ranking for the expected list, perhaps because she used the technology more and was thus more likely, proportionally, to experience more problems. This variation allows for a more highly likely probability of these teachers integrating ICT if it was based solely on their own ability to support each other and not on other external factors (eg hardware reliability).

4.5.1.2 Free Response Narrative

4.5.1.2.1 Organisation Primary Category

Response comment	positive comments	negative comments
Organisation		
Planning time	1 1 1	
Time saving	1 1 1	

Table 4.4 Organisation Primary Category – T1 responses

Teacher 1 was therefore very positive concerning the organisational aspect of this practice; six positive comments were made, three referring to planning time and three to time saved. No negative comments were recorded.

4.5.1.2.2 Classroom Practice Primary Category

Response comment	positive comments	negative comments
Classroom practice		
Level of IT integration concern		1 1 1 1
Use of software for integrating IT	1 1 1	1
Use of internet	1 1	
Use of IT specialist in the classroom rather than left to the class teacher		1

Table 4.5 Classroom Practice Primary Category – T1 responses

Results varied to a greater extent in this category; there was a great deal of concern expressed over the integration of IT into the classroom, though the software utilised was received positively. A negative comment was also levelled at the suggestion of using an IT specialist, while internet usage

was met with optimism. A pattern begins to emerge, arguably, corresponding to the ideas and benefits of IT – which are embraced wholeheartedly – as compared to its actual implementation, which is seen as lacking.

4.5.1.2.3 Self Worth Primary Category

Response comment	positive comments	negative comments
Self worth		
Use of computers increased	1 1 1 1	
Lack of expertise to address faults/errors		1 1 1
Lack of computer empathy	1	1 1
Feeling IT inadequate		1 1 1

Table 4.6 Self Worth Primary Category – T1 responses

Again, one can see that Teacher 1 is pleased with the increase of computer usage; however, there is a sense of inadequacy relating to her ability to fully utilise ICT in the classroom, which impacts heavily on self-worth.

4.5.1.2.4 Training Primary Category

Response comment	positive comments	negative comments
Training		
More training required		1 1
Future use of the computer - internet	1	

Table 4.7 Training Primary Category – T1 responses

Such views are compounded conclusively by this third category: more training is required, though participation in this training would be enthusiastic, one could deduce from the comment embracing future use of the computer – internet.

4.5.1.3 Questionnaire

4.5.1.3.1 Confidence and Competence levels

Confidence and competence		low high				
1	Confidence			1		
2	Competence			1		

Table 4.8 Confidence and Competence levels – T1 responses

4.5.1.3.2 Ease of implementation of ICT

School ICT Environment	1	limited activity school wide	
	2	activity in some subjects	1
	3	very active in some subjects	
	4	very active in most subjects	
Ease of ICT implementation	1	I have had major problems which have persisted	
	2	problems recurred but regular use has been possible	1
	3	early problems arose but these have been overcome	
	4	few problems arose but computer use has not been continuous	
	5	few problems were encountered and use has been continuous	

Table 4.9 Ease of implementation of ICT – T1 responses

Quite a middling response, one could propose: there have been regular problems but nonetheless a regularity of use; and there has been some ICT activity but not an overwhelming amount (perhaps due to the recurring problems). Thus, Teacher 1 feels moderately confident and competent – there is definite room for improvement.

4.5.1.3.3 Contents usage

		none	tried	some	often
Usage contents – facilities	1 Scanner	1			
	2 Datalogging equip	1			
	3 Large screen monitor	1			
	4 Desktop publishing	1			
	5 Personal organiser	1			
	6 Finance or accounts	1			
	7 Spreadsheet		1		
Usage content - application software	8 Database		1		
	9 Fax			1	
	10 Digital camera			1	
	11 Word processing			1	
	12 Printing or drawing			1	
	13 Games or simulations			1	
	14 E-mail				1
	15 CD-ROM				1
	16 Internet				1
	17 Printing				1

Table 4.10 Contents usage – T1 responses

The most overwhelming pattern here is perhaps the lack of equipment which is used frequently; largely those pertaining to the internet, but also CD-ROM usage.

4.5.1.3.4 Internet usage

			none	tried	some	often
Internet usage – school	1	RM(Eduserve)			1	
	2	Freeseve				1
Internet usage – home	3	(own list)				
	4	(own list)				

Table 4.11 Internet usage (general location) – T1 responses

			none	some	high	major
Internet usage	1	to access information for your own use				1
	2	to access information for pupils' use		1		
	3	to demonstrate accessing information to pupil(s)		1		
	4	allowing pupils(s) to access information using your laptop	1			
	5	to access information for colleague(s)		1		
	6	to demonstrate accessing information to colleague(s)	1			
	7	allowing colleagues(s) to access information using your laptop	1			
	8	using e-mail for contact for teaching	1			
	9	using e-mail for contact for administration	1			
	10	using e-mail for contact for personal use				1
	11	demonstrating e-mail to pupil(s)			1	
	12	demonstrating e-mail to colleague(s)		1		
	13	downloading information or images			1	
	14	downloading software		1		

Table 4.12 Internet usage (genre) – T1 responses

An awareness of privacy is demonstrated here; Teacher 1 never allows others to use her laptop, and uses it a great deal for her own private use. Such frequency of use at home may indicate as to why Teacher 1 has expressed greater confidence – throughout all of these tests – in utilising the internet (and is therefore not reflective of any ICT training the school has provided).

4.5.1.3.5 Software usage

		Genre	none	tried	some	often
Software usage	1	Art Gallery	A	1		
	2	Crayola Magic Wardrobe	A		1	
AP plication (n=6)	3	Microsoft Publisher	APP	1		
	4	Microsoft EXCEL	APP	1		
Art (n=2)	5	Microsoft Powerpoint	APP	1		
Geography (n=1)	6	Microsoft WORD	APP		1	
History (n=8)	7	RM Our World	APP		1	
Literacy (n=11)	8	RM Window Box (eg Graph maker, Roamer, etc)	APP	1		
Maths (n=14)	9	The Lost Tribe	G	1		
Problem Solving (n=16)	10	Ancient Egyptians	H	1		
RE ference (n=6)	11	Exploring Castles	H		1	
Science (n=2)	12	History of the World	H	1		
	13	How We Used to Live - Early Victorians	H	1		
	14	Past Lives British History	H	1		
	15	Romans	H		1	
	16	The Evacuees	H	1		
	17	The Romans - Zig Zag	H		1	
	18	Clicker Plus	L	1		
	19	English for SATs 2	L	1		
	20	Fuzzbuzz	L			1
	21	I Love Spelling	L	1		

Table 4.13 Page 1/3 Software usage – T1 responses

		Genre	none	tried	some	often
Software usage	22	Rhyme activities - activity software	L	1		
	23	SATs tests English KS1	L	1		
AP plication (n=6)	24	Science for SATs 2	L	1		
A rt (n=2)	25	Sound activities - literacy	L	1		
G eography (n=1)	26	Starspell 2001	L	1		
H istory (n=8)	27	Wellington Square	L			1
L iteracy (n=11)	28	Word Shark	L			1
M aths (n=14)	29	All about number	M	1		
P roblem S olving (n=16)	32	Arthur's teacher trouble	M	1		
R E F erence (n=6)	31	Counting and sorting	M	1		
S cience (n=2)	33	I Love Maths	M			1
	30	Let's Go with Katy	M			1
	34	Mad About Maths	M			1
	35	Maths skills	M	1		
	36	Number Shark	M			1
	37	Number Skills	M	1		
	38	Practise Maths	M			1
	39	SATs tests Maths KS1	M	1		
	40	Talking Clocks	M	1		
	41	Talking tables (7-9 years)	M	1		
	42	Top of the class/ numbers	M	1		
	43	Albert's house	PS	1		
	44	Crystal Rainforest 2000	PS	1		
	45	Cyberworld	PS	1		
	46	Harry and haunted house	PS	1		
	47	Magic School Bus	PS			1
	48	Map Detective	PS	1		
	49	Max and haunted house	PS	1		
	50	Maximania	PS	1		
	51	Mission Control	PS	1		
	52	Oz, the magical adventure	PS	1		

Table 4.13 Page 2/3 Software usage – T1 responses

		Genre	none	tried	some	often
Software usage	53	PB Bear's birthday party	PS	1		
	54	The Cat in the Hat	PS			1
AP plication (n=6)	55	The fish who could wish	PS	1		
A rt (n=2)	56	The Tortoise and the hare	PS	1		
G eography (n=1)	57	Tizzy's toybox	PS	1		
H istory (n=8)	58	Word puzzles (7-9 years)	PS	1		
L iteracy (n=11)	59	Children's Encyclopedia	REF	1		
M aths (n=14)	60	Encyclopedia -Science	REF	1		
P roblem Solving (n=16)	61	Encyclopedia - Nature	REF	1		
R Eference (n=6)	62	My first dictionary	REF	1		
S cience (n=2)	63	Oxford Interactive Encyclopedia	REF	1		
	64	The New Way Things Work	REF	1		
	65	I Love Science	S			1
	66	Practise Science	S	1		

Table 4.13 Page 3/3 Software usage – T1 responses

There appears to be a great disparity between how much software is potentially available and what has actually been used; Maths and Problem Solving programmes appear to be more popular, though there are still a greater number available than are accessed.

4.5.1.3.6 Patterns of use

			none	some	high	major
Patterns of use - collaboration	1	with the other teachers in my school	T	1		
	2	with whole classes of pupils for teaching	P	1		
A - administration (n=2)	3	with selected groups of pupils for teaching	P		1	
C - curriculum (n=2)	4	with individual pupils for teaching	P		1	
H - home (n=2)	5	with groups of special needs pupils	P	1		
L - local area (n=2)	6	with individual special needs pupils	P	1		
O - others (n=1)	7	with groups of colleagues for teaching	T	1		
P - pupils (n=5)	8	with individual colleagues for teaching	T	1		

Table 4.14 Page 1/2 Patterns of usage – T1 responses

			none	some	high	major
S - self (n=6) T - teaching (n=4) W - wide area (n= 4)	9	with colleagues for administration	T		1	
	10	by yourself in school for teaching purposes	S	1		
	11	by yourself in school for administration	S	1		
	12	by yourself at home for teaching purposes	S	1		
	13	by yourself at home for school administration	S	1		
	14	by yourself at home for personal tasks	S		1	
	15	by yourself at home for entertainment	S		1	
	16	by others at home for any use	O	1		
	17	in a fixed school location	L		1	
	18	in 2 or 3 school locations	W	1		
	19	in 4 or more school locations	W	1		
	20	in a meeting at school	L	1		
	21	in a meeting outside school	W	1		
	22	at home to continue work from school	H	1		
	23	at home for any purpose	H		1	
Patterns of use - location	24	in a location other than school or home	W	1		
	25	to supplement existing teaching provision	C	1		
	26	to supplement existing administrative provision	A	1		
	27	to provide a new teaching resource	C	1		
	28	to provide a new administrative resource	A	1		

Table 4.14 Page 2/2 Patterns of usage – T1 responses

One striking element of this section stems from the reluctance to utilise ICT on a large scale; large group work is reported as never occurring, though it is useful individually or in smaller groups (both in terms of staff and pupils). It is also more likely that ICT will be utilised for administration with

colleagues, rather than teaching. Home-usage still proves most popular, but it is also found moderately useful in both administration and for teaching resources within school.

4.5.1.3.7 Support

		poor	fair	good	excellent	N/A
Support - aspects of usage	1			1		
	2			1		
	3			1		
	4			1		
	5			1		
	6			1		
	7			1		
	8			1		
	9			1		
	10			1		
	11			1		
	12			1		
Support - sources of support	13			1		
	14					1
	15			1		
	16					1
	17					1
	18		1			
	19					1
	20					1
	21					1
	22					1

Table 4.15 Support – T1 responses

In general, the support provided seems to be satisfactory; however there are some gaps in the level of support offered (no LEA advisory service, or software/hardware suppliers).

4.5.1.3.8 Personal Perceptions

			Attitude designator	strongly disagree	disagree	agree	strongly agree	not sure
Personal perceptions	3	The impact on pupil learning of IT has been negligible	L-			1		
	19	Most of my pupils are not aware of the full use of IT in the school	L-		1			
T+ teacher positive outcome	34	Pupils are often put off by computing in school	L-			1		
T- teacher negative outcome	7	Certain groups of pupils have gained a lot from IT	L+		1			
S effects on school	15	Many pupils have been enthusiastic about the IT materials	L+		1			
O effects on others	35	Children readily acquire a working understanding of IT	L+		1			
L effects on pupils' learning	39	Computer games are effective in developing IT skills	L+		1			
	8	IT imposes excessive demands on ordinary people	O-			1		
	12	For most users the costs of IT exceed the benefits	O-		1			
	20	Families without IT facilities will be disadvantaged	O-			1		
	4	Most adults will benefit from the ability to use IT	O+		1			
	24	IT facilities are cheap enough for most families to afford	O+			1		
	28	IT has enabled businesses to provide better services	O+		1			
	2	I felt the money spent on IT was worthwhile	S+		1			

Table 4.16 Page 1/3 Personal Perceptions – T1 responses (sorted by Attitude Designator)

			Attitude designator	strongly disagree	disagree	agree	strongly agree	not sure
Personal perceptions T+ teacher positive outcome T- teacher negative outcome S effects on school O effects on others L effects on pupils' learning	10	The school as a whole has benefited from the introduction of IT	S+		1			
	11	IT has enhanced our SEN provision	S+		1			
	18	IT has assisted school management	S+		1			
	37	I would like the school to develop multimedia laptop provision	S+		1			
	5	Getting to know my laptop has taken up too much of my time	T-			1		
	9	The use of IT has interfered with other aspects of my work	T-		1			
	17	My colleagues in school are sceptical about the use of IT in the school	T-			1		
	22	Most people are unaware of the problems in producing effective IT	T-		1			
	23	I would not have accepted the laptop if I had known what I know now	T-			1		
	25	I have had problems integrating IT provision	T-		1			
	27	I frequently worry about the risk of computer failure	T-		1			
	32	I would not advise the school to spend its money in this way	T-			1		
	33	It is difficult to introduce IT into the pupils' work	T-	1				
	38	I resent devoting leisure time to IT-related tasks	T-			1		
	1	Teachers need laptops to help them develop pupils' IT skills	T+		1			
Personal perceptions	6	The laptop has allowed me to develop my teaching	T+		1			
	13	I was reluctant initially to participate in IT training	T+			1		
	14	I feel I am in command of IT materials	T+		1			
	16	Having the laptop has increased my enthusiasm for IT	T+	1				

Table 4.16 Page 2/3 Personal Perceptions – T1 responses (sorted by Attitude Designator)

			Attitude designator	strongly disagree	disagree	agree	strongly agree	not sure
Personal perceptions	21	I have been able to help curriculum areas outside my own	T+			1		
T+ teacher positive outcome	26	Many pupils' interest in IT has been heightened	T+		1			
T- teacher negative outcome	29	My use of IT has increased substantially	T+		1			
S effects on school	30	I have improved my understanding of pupils' use of computers	T+		1			
O effects on others	31	I enjoy introducing others to the use of computers	T+		1			
L effects on pupils' learning	36	On balance the project's disadvantages outweigh any benefits	T+		1			

Table 4.16 Page 3/3 Personal Perceptions – T1 responses (sorted by Attitude Designator)

Interestingly, there seems to be a general sense that the benefits of IT are not worth the money the school spent on them; Teacher 1 also feels that the laptop has proved both time consuming and perhaps not worth the effort (he/she stated that he/she would not have accepted the laptop based on possession of current knowledge). There also seems to be a lack of interest in ICT demonstrated by pupils – and a concern that families with lower incomes would be disadvantaged by not possessing costly facilities.

4.5.1.4 The Interviews: Analysis of the codified transcripts.

4.5.1.4.1 Interview - Pre lesson (T1)

Recorded unit - T1 Pre Lesson (R- researcher, T1 – teacher)	Central theme
<p>1. R: Okay, what are you going to do?</p> <p>2. T1: Two ICT activities, one is a cyber-hunt type activity with an open ended task where 2 groups of children have got to make a presentation with a title Water Is Important. They have to decide where on the Internet they're going to research it after giving them some initial pointers, so they have to choose sort of chapter headings for it, they have to decide what software package to present it and how to present it and it had to inform the rest of the class so that gives it audience and purpose.</p> <p>3. The other activity is more of a literacy one, partly constrained by the fact that the internet access for the laptops isn't great in the classroom,</p> <p>4. so the others are working off line and they've got to do a piece of persuasive writing on why we should have a world Children's Day in this country. That's after having found out about Children's Day in Japan.</p> <p>5. R: So, why is this particularly important to you? Is it personal, is it curriculum?</p> <p>6. T1: They're both because the geography topic is one that I've come up with personally, our amazing world things and we're looking at all different aspects of geography around the world, but it's also been guided by the stuff that</p> <p>7. the children have responded to best so an open ended internet research task is one of their favourite things because it is variable independently and it's not as prescriptive.</p> <p>8. R: Great, thank you. What IT are you using?</p> <p>9. T1: Laptops, desktops, Internet access, the presentation package of some sort and a word processing package.</p>	<p>2. Children on line researching</p> <p>3. Problems with accessing internet for all the laptops.</p> <p>4. Cross curricular links</p> <p>7. Open ended approach using the internet.</p> <p>9. Using laptops, internet and applications package.</p>

Table 4.17 Page 1/2 Interview - Pre lesson (T1)

Recorded unit - T1 Pre Lesson (R- researcher, T1 – teacher)	Central theme
<p>10. R: What learning do you expect to take place?</p> <p>11. T1: On the geography side using a range of media resources to research and independent research largely, trying to get them to ask questions and then find the right answers to them independently, but also there's a literacy link because some of the others are doing persuasive writing and using the word processor to allow them to edit it and do it efficiently.</p> <p>12. R: The last question is what do you expect to achieve out of this?</p> <p>13. T1: I am looking for the research groups to as I said have come up with meaningful geographic questions and use the IT as a means to answer them, specifically Internet in this particular case.</p> <p>14. With the others I'm looking for them to apply their understanding of the subject in a different context, so turning it into their own persuasive piece of writing based on what they've learned about something else.</p> <p>15. R: Good, thank you.</p>	<p>11. Children's independent researching</p> <p>13. Self motivating children, own internet research.</p> <p>14 Children applying what they have learned to feedback to others</p>

Table 4.17 Page 2/2 Interview - Pre lesson (T1)

4.5.1.4.2 Interview - Post lesson (T1)

Recorded unit - T1 Post Lesson (R- researcher, T1 – teacher)	Central theme
<p>1. R: So what learning took place there?</p> <p>2. T1: The two research groups, I don't think you become a proficient user of the internet or somebody who is able to get what they want from the internet without practice so by giving them a focus and asking them to use it in quite a wide way and then narrow it down and find it,</p> <p>3. I think is a great way in finding their research skills.</p> <p>4. R: Okay, fine, were there any problems with the technology, generally, within the lesson?</p>	<p>2. Focused web-based learning activity.</p> <p>3. Developing children's research skills.</p>

Table 4.18 Page 1/4 Interview - Post lesson (T1)

Recorded unit - T1 Post Lesson (R- researcher, T1 – teacher)	Central theme
<p>5. T1: No. Everything worked that we had. I would have liked to have had Internet access in the classroom for everybody, but in the end didn't have.</p> <p>6. [child's name] had not correctly saved his file on his story but the good thing about that is you're able to recreate it very, very quickly so they're back to where they were and I sorted that out for them, so that's fine. I was able to handle that for them.</p> <p>7. R: What areas would you change?</p> <p>8. T1: In terms of?</p> <p>9. R: Anything in the way you did it, to use technology, whether or not to use Power Point again?</p> <p>10. T1: There's always things you can change, I mean nothing is ever perfect and sometimes you try – but this is the beginning of the interactive white board use and we were really doing a brief reminder of the past two weeks. That didn't need to be, that's just this is what we've been doing.</p> <p>11. R: I like the use of the hyperlinks on the word documents.</p> <p>12. T1: We're trying to be a bit more environmentally conscious and not print off so much stuff, so sometimes sending them to places through a hyperlink is better.</p> <p>13. R: Okay, now the basis of all of this is to work out the difference between what we were like 2 years ago and what we're like now. So, do you think you would have attempted this lesson 2 years ago?</p> <p>14. T1: We didn't have the broadband Internet links in the classroom</p> <p>15. and we only had one mobile interactive white board, so in terms of those developments, no, it wouldn't have been possible.</p> <p>16. R: How about your confidence in using the equipment?</p>	<p>5. No class-wide access to internet.</p> <p>6. Some problems with children saving/loading.</p> <p>10. Newly introduced interactive whiteboards and still learning.</p> <p>12. Use of advanced ICT techniques.</p>

Table 4.18 Page 2/4 Interview - Post lesson (T1)

Recorded unit - T1 Post Lesson (R- researcher, T1 – teacher)	Central theme
<p>17. T1: Well, I came to teaching already as an ICT specialist so in terms of my sort of willingness to use the stuff, I think it hasn't kind of increased, I think that wasn't a big thing I've had to improve.</p> <p>18. What I have tried to do is make ICT much more cross curricular which is why it was in a geography lesson, which is why there was literature going on as well. Part of that sort of whole school cross curricular ICT rather than just ICT skills.</p> <p>19. R: Is there something about how you use ICT now as opposed to the status of how you used it a few years ago?</p> <p>20. T1: I think having the wireless links, having the broadband linked to the laptops, the broadband link to an interactive white board is invaluable and that gets used in probably 90% of what I do.</p> <p>21. R: So it has improved in terms of the use of the internet with broadband and the new interactive whiteboards?</p> <p>22. T1: Particularly with white boards and laptops.</p> <p>23. R: How do you think your skills have changed over the last 2 years, if so, how, and what's caused them to change? Is any aspect in terms of change?</p> <p>24. T1: I think in terms of because my skills from outside was with business data handling so what I have started to do much more is use communications software and presentation practice, the Easy Teach stuff, I use that a lot and so making it much more interactive so it's not me standing there working, it's the children with their hands on the computers and using the skills.</p> <p>25. R: So when do you do your preparation for this?</p> <p>26. T1: I do my preparation outside of school at home, mostly.</p> <p>27. R: What makes it easier to do it outside of home?</p>	<p>18. ICT across the curriculum</p> <p>20. Using internet as major part of ICT work.</p> <p>22. Whiteboards and laptops have improved accessibility.</p> <p>24. Interactive with children.</p> <p>26. Planning done at home, but (28)...</p>

Table 4.18 Page 3/4 Interview - Post lesson (T1)

Recorded unit - T1 Post Lesson (R- researcher, T1 – teacher)	Central theme
<p>28. T1: OH, having the laptop. Having my new laptop, which I've got wireless broadband at home. Before with my old one I was tied to a cable by the telephone point because it was an old Dell laptop.</p>	<p>28. Using laptops at home has improved planning time.</p>
<p>29. R: [T3] said that as well, so having a laptop at home has helped you as well, but it's not so much just the laptop, it's the connection with the broadband?</p>	<p>30. Internet as a large resource.</p>
<p>30. T1: Absolutely because I believe very strongly that the Internet is an incredibly valuable research tool. It has loads there providing you're capable of using it with some discernment,</p>	<p>31. Children see it as this and know how to access it.</p>
<p>31. which is something I've been able to do and that's what I want the children to be able to do, but that's the way I do a lot of my work at home and it's much, much easier for me to do my work at home now and do it.</p>	
<p>32. R: The research has shown two years ago that it was the laptop was having an effect, now it is using broadband. Are there any areas ICT could provide you think needs improving?</p>	
<p>33. T1: I would like to have more reliable things like really good children's encyclopaedias on CD Rom. I'm not that impressed with the ones that we've got, the DK, because the biggest issue I see is resource, the different topics, it would be nice to know that we have a really sparkly online encyclopaedia with the lack of internet access in the classroom, because then you're much more able to direct.</p>	<p>33. Still prefers loaded programmes such as encyclopaedias</p>
<p>34. R: The hard CD based?</p>	
<p>35. T1: Or something that would provide an equivalent function. The Deakin Multimedia Encyclopaedia is nice, but it's very limited in some areas, I think there are others.</p>	
<p>36. R: (inaudible)</p>	
<p>37. T1: No, they don't, and it doesn't work with the operating system we have so yeah, I think having research tools that are loaded that you can use off line for the kids to use is great.</p>	<p>37 Problem with software compatibility</p>
<p>38. R: That's it, thank you. Well done.</p>	

Table 4.18 Page 4/4 Interview - Post lesson (T1)

The responses shown in Table 4.18 suggest that T1 is one of the more confident ‘early adopters’ (Rogers 2003) of ICT. The overall impression is one of anticipation and enthusiasm and high expectations of what can be done as she goes into the lesson. The post interview response gives a similar attitude but is now incorporating the frustration faced due to hardware and software problems. This is an important point when considering innovation adoption – “innovations with favourable implementation characteristics may be expected to be adopted more easily and diffused more rapidly than those with unfavourable characteristics” (Fichman, 1992, p6).

4.6.1 Teacher 2.

4.6.1.1 The Mindmap

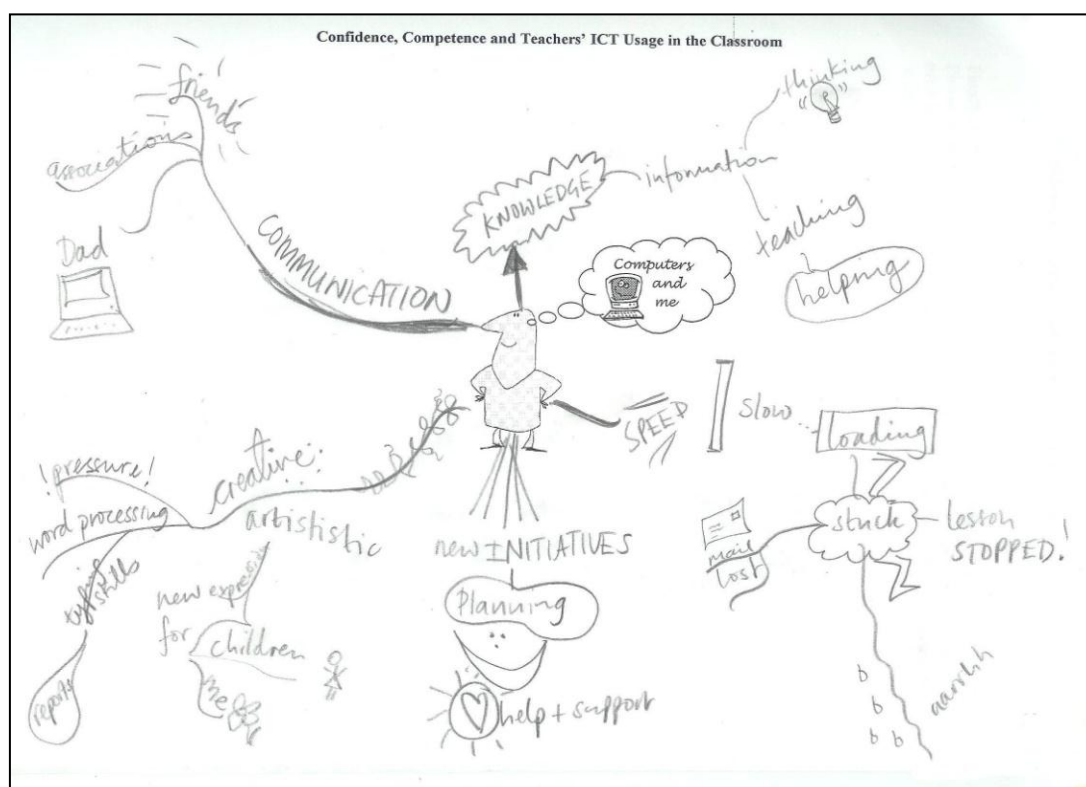


Figure 4.3 T2 Mindmap

Rank ordering :	T2MM
Number nodes:	27
Ranking points - terms:	1
Ranking points - Nodes:	4

Table 4.19 Results of analysis of T2's mindmap.

As Figure 4.3 demonstrates, T2 is a less positive map than that of T1 in terms of her own ICT abilities, perhaps, but with logical connections and a noting of ICT possibilities. Concerns over speed and pressure are articulated, as well as the need for support in order to maximise the potential for new initiatives.

4.6.1.2 Free Response Narrative

4.6.1.2.1 Organisation Primary Category

Response comment	positive comments	negative comments
Organisation		
Planning time	1 1 1	
Time saving	1 1 1	

Table 4.20 Organisation Primary Category – T2 responses

Similar to T1, this category elicited only positive comments from T2 regarding positive potentials for planning time and time-saving through ICT.

4.6.1.2.2 Classroom Practice Primary Category

Response comment	positive comments	negative comments
Self worth		
Use of computers increased	1 1 1 1	
Lack of expertise to address faults/errors		1 1 1
Lack of computer empathy	1	1 1
Feeling IT inadequate		1 1 1

Table 4.21 Classroom Practice Primary Category – T2 responses

A strong amount of negativity was expressed regarding the level of IT integration concern; moreover, a somewhat mixed response to the use of integrative IT software. Some anxieties over the success of utilising IT in the classroom can thus certainly be noted; these seem most specifically linked to integration in general, due to abilities of software and teacher herself.

4.6.1.2.3 Self Worth Primary Category

Response comment	positive comments	negative comments
Classroom practice		
Level of IT integration concern		1 1 1 1
Use of software for integrating IT	1 1 1	1
Use of internet	1 1	
Use of IT specialist in the classroom rather than left to the class teacher		1

Table 4.22 Self Worth Primary Category – T2 responses

Indeed, as with the last category, it can be noted that Teacher 2 feels much less confident in her grasp of IT than Teacher 1: three negative comments corresponded to inadequacy concerning IT, and a further three with a lack of expertise. Though Teacher 2 feels very positively about the increase of

computer usage, he/she is not positive concerning her own relationship with IT and abilities to implement such usage

4.6.1.2.4 Training Primary Category

Response comment	positive comments	negative comments
Training		
More training required		1 1
Future use of the computer - internet	1	

Table 4.23 Training Primary Category – T2 responses

Again, the ideas behind IT implementation in schools do not cause concern for Teacher 2, but her grasp of IT concepts. More training is needed.

4.6.1.3 Questionnaire

4.6.1.3.1 Ease of implementation of ICT

School ICT Environment	1	limited activity school wide		
	2	activity in some subjects		
	3	very active in some subjects		1
	4	very active in most subjects		
Ease of ICT implementation	1	I have had major problems which have persisted		1
	2	problems recurred but regular use has been possible		
	3	early problems arose but these have been overcome		
	4	few problems arose but computer use has not been continuous		
	5	few problems were encountered and use has been continuous		

Table 4.24 Ease of implementation of ICT - T2 responses

Teacher 2's lack of confidence could be attributed to the fact the IT environment is perhaps more pressured in this school – the school is very active in some areas of IT – which makes her major problems with IT (problems which have also persisted) all the more evident. Further evidence for this can also be seen in the Confidence/Competence section which follows.

4.6.1.3.2 Confidence and Competence levels

		low				high
Confidence and competence	1 Confidence	1				
	2 Competence	1				

Table 4.25 Confidence and Competence levels – T2 responses

4.6.1.3.3 Contents usage

			none	tried	some	often
Usage contents – facilities	1 E-mail		1			
	2 CD-ROM			1		
	3 Internet		1			
	4 Fax		1			
	5 Scanner		1			
	6 Digital camera		1			
	7 Datalogging equip		1			
	8 Large screen monitor		1			
	9 Printing			1		
Usage content - application software	10 Word processing				1	
	11 Spreadsheet		1			
	12 Database			1		
	13 Printing or drawing			1		
	14 Desktop publishing			1		
	15 Games or simulations			1		
	16 Personal organiser		1			
	17 Finance or accounts		1			

Table 4.26 Contents Usage – T2 responses

It is only word processing which has been used with any frequency; there are many programmes which have been merely attempted, or not at all.

4.6.1.3.4 Internet Usage

			none	tried	some	often
Internet usage - school	1	RM(Eduserve)	1			
	2	Freearve	1			
Internet usage – home	3	(own list)				
	4	(own list)				

Table 4.27 Internet Usage (general location) – T2 responses

		none	some	high	major
Internet usage	1	to access information for your own use	1		
	2	to access information for pupils' use	1		
	3	to demonstrate accessing information to pupil(s)	1		
	4	allowing pupils(s) to access information using your laptop	1		
	5	to access information for colleague(s)	1		
	6	to demonstrate accessing information to colleague(s)	1		
	7	allowing colleagues(s) to access information using your laptop	1		
	8	using e-mail for contact for teaching	1		
	9	using e-mail for contact for administration	1		
	10	using e-mail for contact for personal use	1		
	11	demonstrating e-mail to pupil(s)	1		
	12	demonstrating e-mail to colleague(s)	1		
	13	downloading information or images	1		
	14	downloading software	1		

Table 4.28 Internet Usage (genre) – T2 responses

As can be seen, the internet is not used by Teacher 2 at all, at home or at school. A lack of frequency in her relationship with the internet could again explain her lack of confidence; particularly when one considers Teacher 1, who is much more confident, but uses the internet regularly in her free time.

4.6.1.3.5 Software usage

			Genre	none	tried	some	often
Software usage	1	Art Gallery	A	1			
	2	Crayola Magic Wardrobe	A	1			
APPLICATION (n=6)	3	Microsoft Publisher	APP	1			
Art (n=2)	4	Microsoft EXCEL	APP	1			
Geography (n=1)	5	Microsoft Powerpoint	APP	1			
History (n=8)	6	Microsoft WORD	APP			1	
Literacy (n=11)	7	RM Our World	APP	1			
	8	RM Window Box (eg Graph maker, Roamer, etc)	APP			1	
Maths (n=14)	9	The Lost Tribe	G	1			
Problem Solving (n=16)	10	Ancient Egyptians	H				1
REFERENCE (n=6)	11	Exploring Castles	H	1			
	12	History of the World	H	1			
	13	How We Used to Live - Early Victorians	H			1	
	14	Past Lives British History	H	1			
	15	Romans	H	1			
	16	The Evacuees	H	1			
	17	The Romans - Zig Zag	H	1			
	18	Clicker Plus	L	1			
	19	English for SATs 2	L	1			
	20	Fuzzbuzz	L	1			
	21	I Love Spelling	L	1			

Table 4.29 Page 1/3 Software Usage – T2 responses

		Genre	none	tried	some	often
Software usage	22	Rhyme activities - activity software	L	1		
	23	SATs tests English KS1	L	1		
AP plication (n=6)	24	Science for SATs 2	L	1		
A rt (n=2)	25	Sound activities - literacy	L	1		
G eography (n=1)	26	Starspell 2001	L	1		
H istory (n=8)	27	Wellington Square	L	1		
L iteracy (n=11)	28	Word Shark	L	1		
M aths (n=14)	29	All about number	M	1		
P roblem Solving (n=16)	32	Arthur's teacher trouble	M	1		
R Eference (n=6)	31	Counting and sorting	M	1		
S cience (n=2)	33	I Love Maths	M	1		
	30	Let's Go with Katy	M	1		
	34	Mad About Maths	M	1		
	35	Maths skills	M	1		
	36	Number Shark	M	1		
	37	Number Skills	M	1		
	38	Practise Maths	M	1		
	39	SATs tests Maths KS1	M	1		
	40	Talking Clocks	M	1		
	41	Talking tables (7-9 years)	M		1	
	42	Top of the class/ numbers	M	1		
	43	Albert's house	PS	1		
	44	Crystal Rainforest 2000	PS		1	
	45	Cyberworld	PS	1		
	46	Harry and haunted house	PS	1		
	47	Magic School Bus	PS	1		
	48	Map Detective	PS			1
	49	Max and haunted house	PS	1		
	50	Maximania	PS	1		
	51	Mission Control	PS	1		
	52	Oz, the magical adventure	PS	1		

Table 4.29 Page 2/3 Software Usage – T2 responses

		Genre	none	tried	some	often
Software usage	53	PB Bear's birthday party	PS	1		
	54	The Cat in the Hat	PS	1		
Application (n=6)	55	The fish who could wish	PS	1		
Art (n=2)	56	The Tortoise and the hare	PS	1		
Geography (n=1)	57	Tizzy's toybox	PS	1		
History (n=8)	58	Word puzzles (7-9 years)	PS	1		
Literacy (n=11)	59	Children's Encyclopedia	REF	1		
Maths (n=14)	60	Encyclopedia -Science	REF	1		
Problem Solving (n=16)	61	Encyclopedia - Nature	REF	1		
REference (n=6)	62	My first dictionary	REF	1		
		Oxford Interactive Encyclopedia	REF	1		
Science (n=2)	63	The New Way Things Work	REF	1		
	64	I Love Science	S		1	
	66	Practise Science	S	1		

Table 4.29 Page 3/3 Software Usage – T2 responses

History, Maths, Problem Solving and Science programmes are used; but one must note that those used are a very small proportion of those potentially available (as in the sample school).

4.6.1.3.6 Patterns of use

			none	some	high	major
Patterns of use - collaboration	1	with the other teachers in my school	T		1	
	2	with whole classes of pupils for teaching	P	1		
A - administration (n=2)	3	with selected groups of pupils for teaching	P	1		
C - curriculum (n=2)	4	with individual pupils for teaching	P		1	
H - home (n=2)	5	with groups of special needs pupils	P	1		
L - local area (n=2)	6	with individual special needs pupils	P	1		
O - others (n=1)	7	with groups of colleagues for teaching	T	1		
P - pupils (n=5)	8	with individual colleagues for teaching	T	1		

Table 4.30 Page 1/2 Patterns of Use – T2 responses

			none	some	high	major
S - self (n=6) T - teaching (n=4) W - wide area (n= 4)	9	with colleagues for administration	T	1		
	10	by yourself in school for teaching purposes	S	1		
	11	by yourself in school for administration	S	1		
Patterns of use - location	12	by yourself at home for teaching purposes	S	1		
	13	by yourself at home for school administration	S	1		
	14	by yourself at home for personal tasks	S	1		
	15	by yourself at home for entertainment	S	1		
	16	by others at home for any use	O	1		
	17	in a fixed school location	L	1		
	18	in 2 or 3 school locations	W	1		
	19	in 4 or more school locations	W	1		
	20	in a meeting at school	L	1		
	21	in a meeting outside school	W	1		
Patterns of use - integration	22	at home to continue work from school	H	1		
	23	at home for any purpose	H	1		
	24	in a location other than school or home	W	1		
	25	to supplement existing teaching provision	C	1		
	26	to supplement existing administrative provision	A	1		
	27	to provide a new teaching resource	C	1		
	28	to provide a new administrative resource	A	1		

Table 4.30 Page 2/2 Patterns of Use – T2 responses

Again, computer usage is very limited in Teacher 2's home. One can also note a similar tendency as found with Teacher 2, of restricting computer access to within small groups and individuals. Moreover, Teacher 2 seems to use the computer infrequently in a variety of situations.

4.6.1.3.7 Support

			poor	fair	good	excellent
Support - aspects of usage	1	guidance before receiving your laptop			1	
	2	guidance on continuing with the laptop			1	
	3	installation/set-up of laptop hardware	1			
	4	installation/set-up of laptop software	1			

Table 4.31 Page 1/2 Support – T2 responses

		poor	fair	good	excellent
Support - aspects of usage	5 installation/set-up of non-laptop hardware	1			
	6 installation/set-up of non-laptop software	1			
	7 day to day usage of hardware	1			
	8 day to day usage of software	1			
	9 using CD-ROMS	1			
	10 using the Internet	1			
	11 telephone line access	1			
	12 printing	1			
	13 RM familiarisation programme	1			
	14 World Wide Web sites	1			
Support - sources of support	15 other colleague in your school	1			
	16 other colleague in another school			1	
	17 LEA advisory service	1			
	18 LEA ICT support service	1			
	19 someone in your family	1			
	20 a friend or acquaintance	1			
	21 hardware supplier(s)	1			
	22 software supplier(s)	1			

Table 4.31 Page 2/2 Support – T2 responses

Such data reflects a very poor level of support provided for Teacher 2, in general. There are only three areas in which Teacher 2 feels satisfied: with her laptop, or within her colleagues. Aside from this, the support provided has been most unsatisfactory, which may heavily contribute to her lack of confidence/competence.

4.6.1.3.8 Personal Perceptions

		Attitude designator	strongly disagree	disagree	agree	strongly agree	not sure
Personal perceptions	3	The impact on pupil learning of IT has been negligible	L-	1			
	1	Most of my pupils are not aware of the full use of IT in the school	L-		1		
T+ teacher positive outcome	3	Pupils are often put off by computing in school	L-			1	
T- teacher negative outcome	4	Certain groups of pupils have gained a lot from IT	L+	1			
S effects on school	1	Many pupils have been enthusiastic about the IT materials	L+	1			
O effects on others	3	Children readily acquire a working understanding of IT	L+	1			
L effects on pupils' learning	5	Computer games are effective in developing IT skills	L+	1			
	8	IT imposes excessive demands on ordinary people	O-	1			
	1	For most users the costs of IT exceed the benefits	O-		1		
	2	Families without IT facilities will be disadvantaged	O-	1			
	4	Most adults will benefit from the ability to use IT	O+	1			
	2	IT facilities are cheap enough for most families to afford	O+		1		
	2	IT has enabled businesses to provide better services	O+		1		
	2	I felt the money spent on IT was worthwhile	S+	1			
	1	The school as a whole has benefited from the introduction of IT	S+	1			
	0						

Table 4.32 Page 1/3 Personal Perceptions – T2 responses (sorted by Attitude Designator)

			Attitude designator					
				strongly disagree	disagree	agree	strongly agree	not sure
Personal perceptions	11	IT has enhanced our SEN provision	S+	1				
	18	IT has assisted school management	S+		1			
T+ teacher positive outcome	37	I would like the school to develop multimedia laptop provision	S+					1
T- teacher negative outcome	5	Getting to know my laptop has taken up too much of my time	T-		1			
S effects on school	9	The use of IT has interfered with other aspects of my work	T-			1		
O effects on others	17	My colleagues in school are sceptical about the use of IT in the school	T-			1		
L effects on pupils' learning	22	Most people are unaware of the problems in producing effective IT	T-	1				
L effects on pupils' learning	23	I would not have accepted the laptop if I had known what I know now	T-	1				
	25	I have had problems integrating IT provision	T-	1				
	27	I frequently worry about the risk of computer failure	T-			1		
	32	I would not advise the school to spend its money in this way	T-					1
	33	It is difficult to introduce IT into the pupils' work	T-			1		
	38	I resent devoting leisure time to IT-related tasks	T-		1			
	1	Teachers need laptops to help them develop pupils' IT skills	T+					1
6	The laptop has allowed me to develop my teaching	T+			1			

Table 4.32 Page 2/3 Personal Perceptions – T2 responses (sorted by Attitude Designator)

			Attitude designator	strongly disagree	disagree	agree	strongly agree	not sure
Personal perceptions	1	I was reluctant initially to participate in IT training	T+	1				
	3							
T+ teacher positive outcome	1	I feel I am in command of IT materials	T+				1	
	4							
T- teacher negative outcome	1	Having the laptop has increased my enthusiasm for IT	T+			1		
	6							
S effects on school	2	I have been able to help curriculum areas outside my own	T+			1		
	1							
O effects on others	2	Many pupils' interest in IT has been heightened	T+		1			
	6							
L effects on pupils' learning	2	My use of IT has increased substantially	T+			1		
	9							
L effects on pupils' learning	3	I have improved my understanding of pupils' use of computers	T+			1		
	0							
	3	I enjoy introducing others to the use of computers	T+			1		
	1							
	3	On balance the project's disadvantages outweigh any benefits	T+			1		
	6							

Table 4.32 Page 3/3 Personal Perceptions – T2 responses (sorted by Attitude Designator)

Interestingly, Teacher 2's enthusiasm for computer learning has not been diminished due to the lack of confidence previously displayed; furthermore, he/she feels that her improvement has been substantial. On the teaching side, nonetheless, there are issues: other colleagues are sceptical, and though most are aware of potential problems, IT has detracted from teaching time devoted to other things as well as causing worries about potential hardware problems. Furthermore, the impact on the school has not always been sufficient; it has been difficult to introduce IT into pupils' learning routines, the money spent on it has not been completely justified, and it has not improved school management.

Teacher 2 feels that IT is accessible for all families, as it is not too costly and thus the benefits outweigh monetary concerns; though those without access will not be disadvantaged. In general, learning outcomes have not been improved by IT, however; it is not easy for pupils to grasp, and some are put off by IT.

4.6.1.4 The Interviews: Analysis of the codified transcripts.

4.6.1.4.1 Interview - Pre lesson (T2)

Recorded unit (R- Researcher T2- Teacher 2)	Central theme
1. R: What did you decide to do?	2. Web-based learning
2. T2: We're doing some research so we're going to do some cyber hunts.	
3. R: So, why is this important to you, is it a personal reason?	
4. T2: Well, because it's a good science thing to do with it, the last few weeks of term involves our research that we're doing in English and topic at the moment and it's a way of infusing research to them really in a fun way.	4. Cross-curricular use of ICT.
5. R: Good, thank you. What ICT are you using?	6. Use of Interactive whiteboard and laptops for learning.
6. T2: The interactive white board just to show everybody what we're doing and give everybody a sense to try it and then we're going to work on the laptops to sort of take it to a different level.	
7. R: Okay, what learning are you expecting to take place?	

Table 4.33 Page 1/2 Interview - Pre lesson (T2)

Recorded unit (R- Researcher T2- Teacher 2)	Central theme
<p>8. T2: Well, there's two levels really, one is using questions, specific questions and so using scanning and skimming a page for information to find an answer to a specific question is what they're going to need to be able to do and</p> <p>9. also to then use some of these websites again in their own research independently so we're going to hopefully look up some stuff about weather, some useful sites and they'll use it in their research and when they're on their own.</p> <p>10. R: Okay and the last point is what's expected to be achieved by all of this on a personal level as well as on a teaching level?</p> <p>11. T2: Well, on a personal level I've not done this before, I've not done cyber hunts with the children so we'll see how it goes and how useful it is and the children, well the children get research skills from the Internet which is a sort of research they have to do as well as doing research in books.</p> <p>12. R: Okay, thank you. That's it.</p>	<p>8. Using other skills</p> <p>9. Promoting independent student research.</p> <p>11. New use of ICT by teacher.</p>

Table 4.33 Page 2/2 Interview - Pre lesson (T2)

4.6.1.4.2 Interview - Post lesson (T2)

Recorded unit (R- Researcher T2- Teacher 2)	Central theme
<p>1. R: Okay, right. What's happened during the lesson?</p> <p>2. T2: Oh, I think it was fine. I think when children get back to their own activity - because the work was website based - some of them needed a lot of help just finding their way on the internet and others are on the internet all the time and it's not a problem for them. Some of them just need support.</p> <p>3. R: Do you think the learning that you wanted took place?</p> <p>4. T2: I think so; I think you could do a long assessment on it. But I think yes, some of their answers are going to need a bit more about recording and then what websites could we then go on to use again, what could we use first and then what are we not interested in.</p>	<p>2. Internet use by children - some good, others needed support.</p> <p>4. Assessment/Next steps</p>

Table 4.34 Page 1/4 Interview - Post lesson (T2)

Recorded unit (R- Researcher T2- Teacher 2)	Central theme
5. R: Okay, good. Thank you. Did the technology used go as planned?	
6. T2: Yes, pretty much on this occasion!	6. Quite positive on hardware
7. R: Have you had problem before?	
8. T2: Yes, some of the laptops don't work, sometimes the internet doesn't work on them, sometimes the laptops haven't been recharged ... you have to check they are recharged and plug them in, but no, on the whole it was okay. It was fine.	8. Problems with hardware
9. R: So, are there areas you would change regarding technology use?	
10. T2: No, I don't think so.	
11. R: Do you think you would have done this two years ago?	10. Still positive re technology use
12. T2: No.	
13. R: Okay, why?	12. Increase in ICT use.
14. T2: Well, I didn't know what cyber hunts were two years ago and I didn't have an interactive white board so anything I was teaching in the way of ICT was done on the PC which was always difficult to manage when you've got 20 odd children needing to see it.	14. Increase in knowledge of websites
15. But the fact that you can do it on the interactive whiteboard and you can check and when you can show them step by step together it makes a big difference.	15. Advantages in new hardware
16. Also being confident to use that particular program, finding a program outside of this site, the Tony Poulter site.	16. Confidence in programme use.
17. I didn't even know that websites like that were even available - that's a teaching tool site, but it also has children's stuff on it so that was actually recommended by staff.	17. Unaware of types of sites available on web.
18. R: That leads to other sites as well.	
19. T2: Yes, there is a huge amount of stuff you can use there. Now actually [child's name] will go on that site alone that are (inaudible) the book they are interested in.	19. Children's ICT confidence on web improved.

Table 4.34 Page 2/4 Interview - Post lesson (T2)

Recorded unit (R- Researcher T2- Teacher 2)	Central theme
<p>20. R: Yeah.</p> <p>21. T2: They actually like that particular site and I can leave them on it happily.</p> <p>22. R: Do you think that your ICT teaching skills have increased over the last two years and why?</p> <p>23. T2: Usually, but I have my own laptop at school that I use at home,</p> <p>24. being 'forced' (humour) by my head teacher to do forms and write reports</p> <p>25. but seeing the advantages of it, of doing things, and then of course with</p> <p>26. the children, seeing how they love it and how motivated they are and how quick they are really with it.</p> <p>27. I enjoy it more now and I'm more confident to use things that are relevant rather than just finding doing a general search which I might have done two years ago, but I don't think it would have been as useful.</p> <p>28. R: So one of the big factors has been having your own laptop?</p> <p>29. T2: Yeah, having my own laptop, having the interactive white boards as well, but obviously I am only just starting with that, but having it there to use in your own time and your own space just means you tend to fiddle around with it to get confident by trying it a little bit (inaudible) the whole unit, just using it a bit and the little starts or looking at an interactive map or something in topic, doing it bit by bit helps.</p> <p>30. R: So you use it for starts in other lessons?</p> <p>31. T2: Yes, I use it in other lessons quite a lot at the moment, more actually then in ICT.</p> <p>32. R: So is there anything else you think has affected the way you've actually done, you've used ICT over the years, that with your own laptop, the interactive white board, has your confidence been built up?</p>	<p>21. Good web sites.</p> <p>23. Use of school laptop at home.</p> <p>24. Directed by HT to use ICT for admin.</p> <p>25. Advantages of using ICT for admin.</p> <p>26. Children motivated.</p> <p>27. Teacher enjoys ICT more</p> <p>29. Introduction of Interactive whiteboards - still learning.</p> <p>31. Use ICT in other curriculum areas.</p>

Table 4.34 Page 3/4 Interview - Post lesson (T2)

Recorded unit (R- Researcher T2- Teacher 2)	Central theme
<p>33. T2: Yes, it's encouraging being in an environment where everybody else is using it confidently,</p> <p>34. all the other teachers or a lot of other teachers using it confidently, seeing what they're getting out of it.</p> <p>35. I'm being encouraged by the Headteacher, I suppose, for me to do it and keep trying and also having the Headteacher coming in and fixing things as we go along.</p> <p>36. R: [Inaudible]</p> <p>37. T2: Part of it is being done where I can sit down and figure out myself, but part of it I have to do...</p> <p>38. R: You wouldn't have done that would you?</p> <p>39. T2: No, there are limits in terms of there are still a lot of things I don't know how to sort out myself which I need to learn, and there are quicker ways to do things which I need to learn how to do as well,</p> <p>40. so there is still areas where I may have to ask [teacher's name] to come in and do. I'm going to have to rely on [teacher's name] a bit more which is obviously going to be a disadvantage because</p> <p>41. [Headteacher] won't be here next year and that makes a difference so next year it will be more difficult. But the [Headteacher] has given me a grounding to build on.</p> <p>42. R: That's brilliant. Thank you.</p>	<p>33. School ethos of support for ICT use.</p> <p>34. Some, not all are more confident</p> <p>35 HT support</p> <p>37. Time to try.</p> <p>39. More to learn</p> <p>40. Use of other teachers for help.</p> <p>41. Loss of key school members who guide ethos.</p>

Table 4.34 Page 4/4 Interview - Post lesson (T2)

As can be seen, prior to the lesson Teacher 2 was enthusiastic about the potential of combining research with a fun, multimedia approach; furthermore, he/she identified the possibility to encourage independent work through IT usage. There was a sense of apprehension in that Teacher 2 was piloting this method – he/she had no previous experience- but she/he had relatively high hopes.

After the lesson, Teacher 2 noted some initial problems in that the children's ability levels are varied; some, therefore, get bogged down in trying to navigate websites rather than absorbing information. Some of the laptops don't always work, and there are also problems connecting to the internet, which

can hinder the lesson; however, on this occasion things 'pretty much' went as planned. Teacher 2 noted an increase in both her own knowledge of websites and ICT as well as the children's, and this was commented on most positively; he/she attributed her own improvement largely to administrative usage and orders from HT. Encouragement, time to study independently and the acquisition of her own laptop has really improved ICT skills as a whole. A supportive network of teachers to share IT is also foregrounded.

4.7.1 Teacher 3

4.7.1.1 The Mindmap

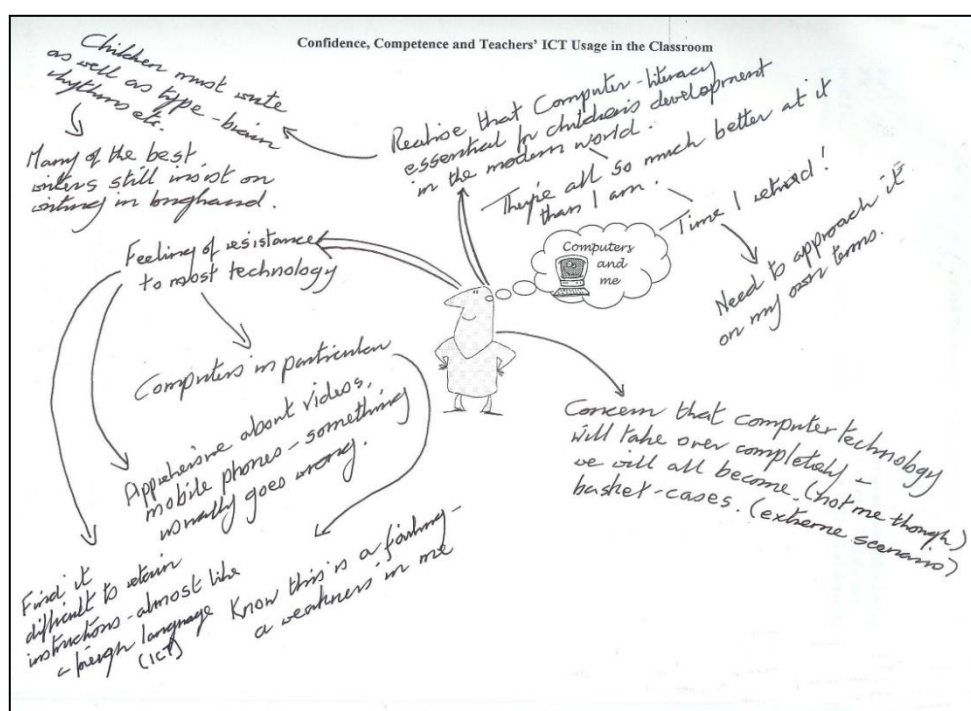


Figure 4.4 T3 Mindmap

Rank ordering :	T3MM
Number nodes:	12
Ranking points - terms:	4
Ranking points - Nodes:	4

Table 4.35: results of analysis of Teacher 3's mindmap.

T3, the teacher considered to be the least IT literate, '*because of feelings of inadequacy*' (comment from free response narrative) did give the greatest number of negative comments in this map. However, though T3 (Figure 4.4) showed uncertainty and concern for her own ability (and its subsequent effect on the school's plan for integration of ICT) the terms from the 'expected list' of negative comments were almost non-existent.

4.7.1.2 Free Response Narrative

4.7.1.2.1 Organisation Primary Category

Response comment	positive comments	negative comments
Organisation		
Planning time	1 1 1	
Time saving	1 1 1	

Table 4.36 Organisation Primary category – T3 responses

A uniform positivity concerning the planning time and time saving of IT has therefore been demonstrated by all three teachers.

4.7.1.2.2 Classroom Practice Primary Category

Response comment	positive comments	negative comments
Classroom practice		
Level of IT integration concern		1 1 1 1
Use of software for integrating IT	1 1 1	1
Use of internet	1 1	
Use of IT specialist in the classroom rather than left to the class teacher		1

Table 4.37 Classroom Practice Primary category – T3 responses

4.7.1.2.3 Self Worth Primary Category

Response comment	positive comments	negative comments
Self worth		
Use of computers increased	1 1 1 1	
Lack of expertise to address faults/errors		1 1 1
Lack of computer empathy	1	1 1
Feeling IT inadequate		1 1 1

Table 4.38 Self Worth primary category – T3 responses

Similar to Teacher 2, Teacher 3 feels positive about the potential of increased IT usage – particularly the use of internet, increase of computers and some software; however, he/she feels inadequate and incompetent in her IT ability, particularly when addressing faults/errors.

4.7.1.2.4 Training Primary Category

Response comment	positive comments	negative comments
Training		
More training required		1 1
Future use of the computer – internet	1	

Table 4.39 Training Primary Category – T3 responses

It is perhaps unsurprising, therefore, that Teacher 3 also reports negatively on her training, but is optimistic about theoretical future use of the computer – internet.

4.7.1.3 Questionnaire

4.7.1.3.1 Ease of implementation of ICT

To determine the level of effort the teachers felt the school was providing in integrating ICT.

School ICT Environment	1	limited activity school wide		
	2	activity in some subjects		
	3	very active in some subjects		1
	4	very active in most subjects		
Ease of ICT implementation	1	I have had major problems which have persisted		
	2	problems recurred but regular use has been possible		1
	3	early problems arose but these have been overcome		
	4	few problems arose but computer use has not been continuous		
	5	few problems were encountered and use has been continuous		

Table 4.40 Ease of Implementation of ICT – T3 responses

As noted in the case of Teacher 2, if the school is very active in some areas of IT, there is perhaps a greater level of pressure on a teacher to be confident in IT; problems therefore seem maximised.

Teacher 3 has experienced some recurring problems, but nonetheless fortunately regular use has still been possible.

4.7.1.3.2 Confidence and Competence levels

		low				high
Confidence and competence	1	Confidence			1	
	2	Competence			1	

Table 4.41 Confidence and competence levels – T3 responses

4.7.1.3.3 Contents usage

		none	tried	some	often
Usage contents – facilities	1	E-mail			1
	2	CD-ROM			1
	3	Internet			1
	4	Fax		1	
	5	Scanner	1		
	6	Digital camera		1	
	7	Datalogging equip	1		
	8	Large screen monitor			1
	9	Printing			1
Usage content - application software	10	Word processing			1
	11	Spreadsheet			1
	12	Database		1	
	13	Printing or drawing			1
	14	Desktop publishing		1	
	15	Games or simulations		1	
	16	Personal organiser	1		
	17	Finance or accounts	1		

Table 4.42 Contents Usage – T3 responses

Nonetheless, Teacher 3 feels moderately confident and competent, which perhaps relates to her frequent use of certain facilities such as E-mail, CD-Rom, Internet, and Office processing programmes. Interestingly, he/she is less active in utilising the computer for organisational, entertainment and financial resources.

4.7.1.3.4 Internet usage

			None	tried	some	often
Internet usage - school	1	RM(Eduserve)			1	
	2	Freeserve			1	
Internet usage - home	3	(own list)				
	4	(own list)				

Table 4.43 Internet Usage (general location) – T3 responses

			none	some	high	major
Internet usage	1	to access information for your own use		1		
	2	to access information for pupils' use		1		
	3	to demonstrate accessing information to pupil(s)		1		
	4	allowing pupils(s) to access information using your laptop	1			
	5	to access information for colleague(s)		1		
	6	to demonstrate accessing information to colleague(s)		1		
	7	allowing colleagues(s) to access information using your laptop		1		
	8	using e-mail for contact for teaching		1		
	9	using e-mail for contact for administration		1		
	10	using e-mail for contact for personal use		1		
	11	demonstrating e-mail to pupil(s)	1			
	12	demonstrating e-mail to colleague(s)	1			
	13	downloading information or images	1			
	14	downloading software	1			

Table 4.44 Internet Usage (genre) – T3 responses

There is some Internet usage, but never to demonstrate email, to download images or software, or shared usage (Teacher 3 would not allow a pupil or colleague to access her laptop). A level of confidence is thus demonstrated, but perhaps not a sense of ease.

4.7.1.3.5 Software usage

			Genre	none	tried	some	often
Software usage	1	Art Gallery	A	1			
	2	Crayola Magic Wardrobe	A			1	
APP lication (n=6)	3	Microsoft Publisher	APP				1
Art (n=2)	4	Microsoft EXCEL	APP				1
Geography (n=1)	5	Microsoft Powerpoint	APP				1
History (n=8)	6	Microsoft WORD	APP				1
Literacy (n=11)	7	RM Our World	APP				1
	8	RM Window Box (eg Graph maker, Roamer, etc)	APP				1
Maths (n=14)	9	The Lost Tribe	G	1			
Problem Solving (n=16)	10	Ancient Egyptians	H	1			
REF erence (n=6)	11	Exploring Castles	H	1			
Science (n=2)	12	History of the World	H	1			
	13	How We Used to Live - Early Victorians	H	1			
	14	Past Lives British History	H				1
	15	Romans	H	1			
	16	The Evacuees	H	1			
	17	The Romans - Zig Zag	H	1			
	18	Clicker Plus	L	1			
	19	English for SATs 2	L	1			
	20	Fuzzbuzz	L	1			
	21	I Love Spelling	L	1			

Table 4.45 Page 1/3 Software Usage – T3 responses

		Genre	none	tried	some	often
Software usage	22	Rhyme activities - activity software	1			
	23	SATs tests English KS1	1			
APPLICATION (n=6)	24	Science for SATs 2	1			
Art (n=2)	25	Sound activities - literacy				1
Geography (n=1)	26	Starspell 2001	1			
History (n=8)	27	Wellington Square	1			
Literacy (n=11)	28	Word Shark	1			
Maths (n=14)	29	All about number			1	
Problem Solving (n=16)	32	Arthur's teacher trouble			1	
REFERENCE (n=6)	31	Counting and sorting	1			
Science (n=2)	33	I Love Maths	1			
	30	Let's Go with Katy	1			
	34	Mad About Maths	1			
	35	Maths skills	1			
	36	Number Shark	1			
	37	Number Skills			1	
	38	Practise Maths				1
	39	SATs tests Maths KS1	1			
	40	Talking Clocks	1			
	41	Talking tables (7-9 years)	1			
	42	Top of the class/ numbers	1			
	43	Albert's house			1	
	44	Crystal Rainforest 2000	1			
	45	Cyberworld	1			
	46	Harry and haunted house				1
	47	Magic School Bus	1			
	48	Map Detective	1			
	49	Max and haunted house				1
	50	Maximania			1	
	51	Mission Control	1			
	52	Oz, the magical adventure	1			
	53	PB Bear's birthday party	1			
	54	The Cat in the Hat				1
	55	The fish who could wish				1

Table 4.45 Page 2/3 Software Usage – T3 responses

			Genre	none	tried	some	often
Software usage	56	The Tortoise and the hare	PS	1			
	57	Tizzy's toybox	PS				1
Application (n=6)	58	Word puzzles (7-9 years)	PS	1			
Art (n=2)	59	Children's Encyclopedia	REF		1		
Geography (n=1)	60	Encyclopedia -Science	REF	1			
History (n=8)	61	Encyclopedia - Nature	REF	1			
Literacy (n=11)	62	My first dictionary	REF			1	
Maths (n=14)	63	Oxford Interactive Encyclopedia	REF	1			
Problem Solving (n=16)	64	The New Way Things Work	REF	1			
REference (n=6)	65	I Love Science	S	1			
Science (n=2)	66	Practise Science	S	1			

Table 4.45 Page 3/3 Software Usage – T3 responses

Teacher 3 does make substantial use of several applications; furthermore, he/she uses some programmes very often, such as literacy, history, problem-solving and maths. A number of other programmes – mainly maths, problem-solving and reference – are used at times. As with the two other teachers, however, there are a huge number of programmes which are never accessed. This arguably demonstrates a reluctance to try new things; routine is preferred in software.

4.7.1.3.6 Patterns of use

			none	some	high	major
Patterns of use - collaboration	1	with the other teachers in my school	T	1		
	2	with whole classes of pupils for teaching	P	1		
A - administration (n=2)	3	with selected groups of pupils for teaching	P	1		
C - curriculum (n=2)	4	with individual pupils for teaching	P		1	

Table 4.46 Page 1/2 Patterns of Use – T3 responses

			none	some	high	major
H - home (n=2)	5	with groups of special needs pupils	P		1	
L - local area (n=2)	6	with individual special needs pupils	P	1		
O - others (n=1)	7	with groups of colleagues for teaching	T	1		
P - pupils (n=5)	8	with individual colleagues for teaching	T	1		
S - self (n=6)	9	with colleagues for administration	T	1		
T - teaching (n=4)	10	by yourself in school for teaching purposes	S			1
W - wide area (n= 4)	11	by yourself in school for administration	S			1
	12	by yourself at home for teaching purposes	S			1
	13	by yourself at home for school administration	S			1
	14	by yourself at home for personal tasks	S			1
	15	by yourself at home for entertainment	S	1		
	16	by others at home for any use	O		1	
Patterns of use - location	17	in a fixed school location	L			1
	18	in 2 or 3 school locations	W	1	1	
A - administration (n=2)	19	in 4 or more school locations	W	1		
C - curriculum (n=2)	20	in a meeting at school	L	1		
H - home (n=2)	21	in a meeting outside school	W		1	
L - local area (n=2)	22	at home to continue work from school	H		1	
O - others (n=1)	23	at home for any purpose	H	1		
P - pupils (n=5)	24	in a location other than school or home	W	1		
Patterns of use - integration	25	to supplement existing teaching provision	C	1		
	26	to supplement existing administrative provision	A	1		
	27	to provide a new teaching resource	C	1		
	28	to provide a new administrative resource	A	1		

Table 4.46 Page 2/2 Patterns of Use – T3 responses

Interestingly, there has been some tackling of usage for whole classes, instead of restricting this to small groups and individuals as with Teacher 1 and 2 (though individual teaching is the area most frequently undertaken). Major usage occurs independently, which should have a positive impact on Teacher 3's own skill sets. Indeed, as can be seen from the Patterns of use – integration section,

Teacher 3 appears to readily integrate ICT with her everyday life through some use of the laptop away from home/school. It is also used heavily to supplement current administration and resources.

4.7.1.3.7 Personal Perceptions

			Attitude designator	strongly disagree	disagree	agree	strongly agree	not sure
Personal perceptions	3	The impact on pupil learning of IT has been negligible	L-			1		
	19	Most of my pupils are not aware of the full use of IT in the school	L-			1		
	34	Pupils are often put off by computing in school	L-			1		
	7	Certain groups of pupils have gained a lot from IT	L+		1			
	15	Many pupils have been enthusiastic about the IT materials	L+		1			
	35	Children readily acquire a working understanding of IT	L+		1			1
	39	Computer games are effective in developing IT skills	L+		1			
	8	IT imposes excessive demands on ordinary people	O-				1	
	12	For most users the costs of IT exceed the benefits	O-			1		1
	20	Families without IT facilities will be disadvantaged	O-			1		1
T+ teacher positive outcome	4	Most adults will benefit from the ability to use IT	O+		1			
	24	IT facilities are cheap enough for most families to afford	O+			1		
T- teacher negative outcome								
S effects on school								
O effects on others								
L effects on pupils' learning								

Table 4.47 Page 1/3 Personal Perceptions – T3 responses (sorted by Attitude Designator)

			Attitude designator					
				strongly disagree	disagree	agree	strongly agree	not sure
Personal perceptions	28	IT has enabled businesses to provide better services	O+		1			
	2	I felt the money spent on IT was worthwhile	S+		1			
T+ teacher positive outcome	10	The school as a whole has benefited from the introduction of IT	S+		1			
T- teacher negative outcome	11	IT has enhanced our SEN provision	S+		1			
S effects on school	18	IT has assisted school management	S+		1			
O effects on others	37	I would like the school to develop multimedia laptop provision	S+		1			
L effects on pupils' learning	5	Getting to know my laptop has taken up too much of my time	T-				1	
	9	The use of IT has interfered with other aspects of my work	T-			1		
	17	My colleagues in school are sceptical about the use of IT in the school	T-			1		
	22	Most people are unaware of the problems in producing effective IT	T-		1			
	23	I would not have accepted the laptop if I had known what I know now	T-				1	
	25	I have had problems integrating IT provision	T-			1		
	27	I frequently worry about the risk of computer failure	T-			1		
	32	I would not advise the school to spend its money in this way	T-			1		
	33	It is difficult to introduce IT into the pupils' work	T-			1		
	38	I resent devoting leisure time to IT-related tasks	T-			1		
	1	Teachers need laptops to help them develop pupils' IT skills	T+		1			
	6	The laptop has allowed me to develop my teaching	T+		1			
	13	I was reluctant initially to participate in IT training	T+				1	

Table 4.47 Page 2/3 Personal Perceptions – T3 responses (sorted by Attitude Designator)

		Attitude designator						
			strongly disagree	disagree	agree	strongly agree	not sure	
Personal perceptions	14							
		I feel I am in command of IT materials	T+		1			
	16	Having the laptop has increased my enthusiasm for IT	T+		1			
T+ teacher positive outcome	21	I have been able to help curriculum areas outside my own	T+	1				
T- teacher negative outcome	26	Many pupils' interest in IT has been heightened	T+		1			
S effects on school	29	My use of IT has increased substantially	T+			1		
O effects on others	30	I have improved my understanding of pupils' use of computers	T+			1		
L effects on pupils' learning	31	I enjoy introducing others to the use of computers	T+			1		
	36	On balance the project's disadvantages outweigh any benefits	T+			1		

Table 4.47 Page 3/3 Personal Perceptions – T3 responses (sorted by Attitude Designator)

Less positive comments are attributed to the possession of a laptop; Teacher 3 disagrees both that teacher-owned-laptops increase their ability to develop pupils' IT skills, or their own teaching, or their enthusiasm towards IT. Indeed, Teacher 3 was initially very reluctant to participate in training and does not now feel in command of these materials; nonetheless, her command of IT has improved. Overall, the project's disadvantages outweigh the benefits; indeed, Teacher 3 is unsure as to how much this has helped, from increasing pupil's understanding of computers and also enhancing the teacher's own enjoyment of computers. There is a great deal of satisfaction with the time consuming nature of learning IT skills; from devoting one's own time to improving IT skills, to attempting to introduce this into the pupil's work, to the time spent worrying about possible computer failures.

Moreover, Teacher 3 indicates quite strongly that the school should have not spent so much money on this project; children have not been encouraged, they are put off by computing in school, and the school has not benefited as a whole.

4.7.1.4 The Interviews: Analysis of the codified transcripts.

4.7.1.4.1 Interview Pre Lesson (T3)

Recorded unit (R- Researcher T3- Teacher 3)	Central theme
1. What did you decide to do?	
2. T3: This is a literacy lesson, so we are going to look at how to develop a story. If the children want to they can use a laptop to help them write the story.	2. Using wordprocessing
3. R: So, why is this important to you, is it a personal reason?	
4. T3: I don't normally use computers for this, you know I'm not hat comfortable with them yet; but I am trying really hard to see if they make it better; I hope the children know how to get the laptops going! I am trying to put some of that training to good use.	4. Student familiarity with hardware.
5. R: Good, thank you. What ICT are you using?	
6. T3: The laptops only, I've not got the hang of the new boards, so I will go through my introduction using the material I have already prepared.	6. Use of laptops for learning
7. R: Okay, what learning are you expecting to take place?	

Table 4.48 Page 1/2 Interview Pre Lesson (T3)

Recorded unit (R- Researcher T3- Teacher 3)	Central theme
<p>8. T3: How to plan and structure a story; I don't think the approach will be any different than when I did this without a computer but I would like to see how different it could be [indistinct words]... the children can try and see, but I worry that their typing skills are going to slow them down and that they could be trying too hard with the computer and not concentrate on the story journey process that I am teaching about.</p> <p>9. R: Okay and the last point is what's expected to be achieved by all of this on a personal level as well as on a teaching level?</p> <p>10. T3: You know I'm not comfortable with computers. I can see their need for the kids for their future, but I don't think I can them see them being fully used in my classes before I retire. I am willing to try anything and I at least feel comfortable with this level of using. Using a wordprocessor. For the children, I will see how it goes.</p> <p>11. R: Okay, thank you. That's it.</p>	<p>8. Using other skills - keyboard</p> <p>10. New use of ICT by teacher.</p>

Table 4.48 Page 2/2 Interview Pre Lesson (T3)

4.7.1.4.2 Interview Post Lesson (T3)

Recorded unit (R- Researcher T3- Teacher 3)	Central theme
<p>1. So what learning took place there?</p> <p>2. T3: They spent so much time on their typing that in the end I had them stop and had them work on their paper versions.</p> <p>3. We got the story plan finished but not the story. I felt frustrated despite the help from [name of Teaching Assistant].</p> <p>4. R: Okay, fine, what where the problems with the technology, generally, within the lesson?</p>	<p>2. Lack of keyboard skills affected time taken</p> <p>3. IT slowing down work, not enhancing</p>

Table 4.49 Page 1/3 Interview Post Lesson (T3)

Recorded unit (R- Researcher T3- Teacher 3)	Central theme
<p>5. T3: [Child's name] was very fast on the typing and did produce a good draft. [Children's names] didn't hardly do anything. Spent most of the time trying to type in their story but their typing skills aren't up to it. The laptops worked well, no problems, though one had to be started twice. The children seemed to like using them, but I don't think it helped with what I wanted to teach them.</p>	5. Children enjoy using IT; teacher felt it hadn't helped her.
<p>6. Maybe more time needs to be spent on teaching them typing?</p>	6. Some time spent on keyboard skills.
<p>7. R: What areas would you change?</p>	
<p>8. T3: In my lessons? I wouldn't change my planning. Oh, you mean with the computers. I would not use them for this again. In SATs they have to write, in lessons they have to write. Using computers for projects may be good, but they [the children] don't know, don't use them enough to be as quick or productive.</p>	8. No reason to adopt IT
<p>9. R: Anything in the way you did it, to use technology?</p>	
<p>10. T3: I looked at what [other teacher's name] has been doing. She is very good, but I don't think I can use them [computers] like that. I could see and help the children with simple wordprocessing but I was just frustrated by how long it took them to produce something that I was able to do with them before in half the time.</p>	10. Wordprocessing skills at basic level.
<p>11. R: Okay, now the basis of all of this is to work out the difference between what we were like 2 years ago and what we're like now. So, do you think you would have attempted this lesson 2 years ago?</p>	
<p>12. T3: No, I wouldn't have seen the need. I use OHP and photocopy cut and paste sheets that I use for springboard activities. The OHP, if it goes wrong is easy to fix. Normally it's just the bulb. I did feel under pressure a little to use the computers.</p>	12. More understandable technology
<p>13. The training we tried wasn't very good and I still think of myself of a very beginner. In some respects I am glad that I don't have to work on using computers. I do remember when the big push was for using OHPs and to move away from just chalkboards, so maybe it is time to move on!</p>	13. Reluctant adopter

Table 4.49 Page 2/3 Interview Post Lesson (T3)

Recorded unit (R- Researcher T3- Teacher 3)	Central theme
<p>14. R: How about your confidence in using the equipment?</p> <p>15. T3: I have been teaching for longer than I care to remember and I am afraid that my confidence in this new initiative is better left to the younger teachers like [teachers' names].</p> <p>16. R: Is there <i>anything</i> [note change in question approach because of previous answers] about how you use ICT now as opposed to the status of how you used it a few years ago?</p> <p>17. T3: I feel a little ashamed to say that there isn't. But I don't think the children are any worse off. My SATs results are still as good!</p> <p>18. R: How do you think your skills have changed over the last 2 years, if so, how, and what's caused them to change? Is any aspect in terms of change?</p> <p>19. T3: You know when the NOF training came in I thought "Great! Now I can learn!" But the training didn't help me – I don't have a computer at home and the way it was set up meant that I was jumping through hoops just for the school to get the money for the laptops it wanted. I just felt that for me, it so disappointing.</p> <p>20. R: That's it, thank you. Well done.</p>	<p>15. Age concern. 17. Can't see necessity.</p> <p>19. NOF training feedback</p>

Table 4.49 Page 3/3 Interview Post Lesson (T3)

Almost immediately, Teacher 3 mentions her own discomfort at using computers; however, he/she is making a concerted effort to integrate them by using computers in an area he/she would not usually tend to. Teacher 3 is attempting to integrate laptops into her usual method of teaching, and will not be using the interactive whiteboards and he/she has not quite mastered these yet. However, he/she is not confident that using laptops will make much of a difference; furthermore, he/she worries laptops will produce an added hindrance to the children's understanding due to their slow typing skills. A great deal of apprehension is thus expressed.

Consequently, Teacher 3 felt that her prediction about slowing down of learning due to lack of keyboard skills has been realised; Teacher 3 adds that this caused much frustration on her part. Though the children enjoyed the IT element, the teacher feels that it detracts from what they should be enjoying; it provides them with an additional point of focus, perhaps, rather than increasing their concentration on literacy. Teacher 3 felt it was so unsuccessful that he/she would not utilise computers again; he/she does not feel the need to change her lesson plan to accommodate the laptops further: Teacher 3 obviously feels the benefits are not substantial enough to justify alterations in this case. This could be attributed to the fact that Teacher 3 feels unconfident in her own IT skills as the training he/she was given was not sufficient – Teacher 3 has also felt under pressure to embrace IT and is somewhat reluctant to change her methods, which she has found consistently successful. This was attributed by Teacher 3 to her age; new initiatives are ‘better left to the younger teachers’. A flaw in the training is perhaps displayed here; it has not catered for the differing needs of experienced, older teachers, or proved to them that they should embrace the new method.

Chapter 5 CROSS CASE ANALYSIS - OVERVIEW ANALYSIS OF THE COHORT

5.1 An Holistic Summary

Now that we have charted the independent cases, it would perhaps be pertinent to review these holistically; some final thoughts and theoretical, critical insight analysing the relationship between the results would enrich my evaluation of ICT integration on a practical level. I will also include some suggestions for future research.

5.2. The Mind maps

Together, the mind maps' scores are thus:

Rank ordering :	T1MM	T2MM	T3MM
Number nodes:	64	27	12
Ranking points - terms:	2	1	4
Ranking points - Nodes:	4	4	4

Table 5.1 results of analysis of cohort's mind maps.

How effective was the mindmap exercise in highlighting the teachers' attitudes? It does indeed show, as evidence through the individual reportage, that Teacher 1 is the most positive, followed respectively by Teacher 2 and Teacher 3, with the latter significantly less enthusiastic regarding IT.

Although only a small number were involved in this study, the literature and the results indicate that the use of mind maps to record 'feelings' was a useful tool to act as a visual gauge for feedback. The use of mind maps provided good visual discrimination between what each of the creators felt about 'Computers and Me', and, although some careful consideration was needed to prepare a scoring rubric, they were easy to produce and allowed the creator to freely construct their own visual image of how they perceived a topic.

It may be beneficial, perhaps through future research, to determine if using mind maps (referring to McLay and Brown, 2003) with a more focused approach, could be used to obtain 'before and after' evidence of the feeling of effectiveness of a professional development programme. In addition, using a computer programme such as Concept Draw's Mind maps (2007) or C-Tools (Luckie *et al*, 2004; Michigan State University C-Tools, 2003) and a self-scoring map tool such as TPL-KATS (Hoeft, *et al*, 2003) could make understanding and interpreting the maps easier.

5.3 The Free-Response Narrative

5.3.1 Interpreting the Equipment Primary Category

Research by Snoeynik and Ertmer (2001) found that when teachers tried to use technology and the hardware malfunctioned, they was often a time gap before coming back to try it again, the corollary of this is demonstrated by the research of Lloyd and Gressard (1986) who showed that teachers' positive attitude to ICT correlated with a positive experience with computer technology. Comments typifying the more mechanical negative aspects of integrating ICT were: '*Failure of hardware and software causing time-wasting and frustration*' (T1) and '*In class, not being able to remedy faults for children instantly*' (T1); '*The computer says "error" but you don't know what! Eg not printing or not loading something or refusing to shut down*' (T2); '*I enjoy manually cutting and pasting my own pictures to make worksheets more interesting – why would I want to spend time scanning and electronically cutting and pasting – my way is easier and more reliable*' (T3).

However, as Becker (1998, p289) pointed out “At the same time, exemplary teachers make greater demands on available resources and face problems that other computer-using teachers are less likely

to face”. It is clear that there is one member of the cohort (T3) who is definitely one of Rogers’ (2003) ‘resistors’. So, although this study's cohort were facing some problems and this can, as can be seen, lead to frustration, one of the reasons why at least some of the participants could be facing such problems is that they are pushing their ICT skills and the technology (especially the broadband internet access) to the limit. With developments in technology, there may be an argument to re-visit the cohort (especially T3) and see whether improvements in wireless access connection speeds (and the ability to have more than four laptops access one wireless access point) would have made connection easier, frustration levels lower and learning more effective.

5.3.2 Interpreting the Organisation Primary Category

Response comment	positive comments	negative comments
Organisation		
Planning time	1 1 1	
Time saving	1 1 1	

Table 5.2 Interpreting the Organisation Primary Category - Cohort

In considering whether computers had changed how they worked, there were only positive comments:

'I feel that I spend less time planning due to work on the computer - everything is planned on the computer/saved/reused'; (T2)

“T1: When do you do your preparation for this?

T1: I do my preparation outside of school at home, mostly.

R: What makes it easier to do it outside of home?

T1: OH, having the laptop. Having my new laptop, which I’ve got wireless broadband at home. Before with my old one I was tied to a cable by the telephone point because it was an old Dell laptop.” (extract from T1’s post lesson interview)

This is consistent with much of the research (OfSTED, 2005, BECTA, 2008): “Many teachers made fundamental changes to their ways of working, their enthusiasm for their work increased and there were positive benefits for teaching and learning as well as wider benefits for pupils and other teachers” (BECTA, 2008, p4).

The key word here is ‘many’. Even in a small, supportive cohort there are still members who are struggling to change the way they have been working from the ‘old, tried and reliable methods’.

“Something new is always coming along and I’ll never be able to learn it all, so I don’t see any point in trying.” (T3).

Approaching CPD for cohorts with this range of comfort-level is a challenge. The NOF approach (NGFL,2000) which relied heavily on an individual’s commitment to working independently on the programme would not work here; a bespoke, mentoring approach may be of more benefit – certainly it may have been more successful in getting T3 out of the IT starting gate.

5.3.3 Interpreting the Classroom Practice Primary Category

Response comment	positive comments	negative comments
Classroom practice		
Level of IT integration concern		1 1 1 1
Use of software for integrating IT	1 1 1	1
Use of internet	1 1	
Use of IT specialist in the classroom rather than left to the class teacher		1

Table 5.3 Interpreting the Classroom Practice Primary Category - Cohort

As the whole purpose of the ICT initiative was to have an impact on the children's learning, it is here that there was most ambiguity from the positive: *'I thoroughly enjoy interactive whiteboards and have found this really enhancing my teaching'(T2);* to the negative: *'I felt quite confident using [computers]but others may need more training to introduce how they work and how to use them'* (T2) which was a telling reflection on the NOF training (which had only recently been completed at the school) but was consistent with findings from other research (OfSTED, 2002c; Davis *et al.*,2008).

5.3.4 Interpreting the Self Worth Primary Category

Response comment	positive comments	negative comments
Self worth		
Use of computers increased	1 1 1 1	
Lack of expertise to address faults/errors		1 1 1
Lack of computer empathy	1	1 1
Feeling IT inadequate		1 1 1

Table 5.4 Interpreting Self Worth Primary Category - Cohort

Many of the technologies used in education were designed to serve the needs of business (BECTA, 2007). While business deals with specific software - often bought as an integrated package to ease transfer of information across its components and is used on an individual basis - the teacher in the classroom is faced with a wide variety of software programmes each with their own protocols and user-interfaces. In addition, the teacher is also faced with a group of learners with their own machines all eager to be used, yet with not easy path to move forward without guidance from the teacher. As T3 put it: *'While I fully agree that children should be confident in a technology which so much broadens their horizons and will be so much a part of their future, I have found it difficult,*

partially because of feelings of inadequacy on my part, to use it routinely as part of my teaching'.

T1, on the other hand wanted to use ICT as much as possible but acknowledged that the time taken to adequately support it during a lesson, meant that she would “ *give [her] classroom assistant responsibility for much of my IT syllabus as I don't feel that I can spare the time during lesson times to help the pupils sufficiently*” (T1).

The NOF training, moreover, focused on applications and planning for integration when some teachers would also have preferred to have some “*training to introduce how they work and how to use them*” (T2). Addressing this key area is fundamental for ICT to become embedded into teaching and learning. The approach has to be one of catering for the individual needs of the teachers; for some it may well be some additional time on basic ‘computer first aid’ troubleshooting, while for others it would be time spent on sitting down with them to help appreciate how ICT can improve planning efficiency, it can improve access to a wealth of information and resources on line and that ‘cutting and pasting’ can become a little more sophisticated than with just scissors.

5.3.5 Interpreting the Training Primary Category

Response comment	positive comments	negative comments
Training		
More training required		1 1
Future use of the computer - internet	1	

Table 5.5 Interpreting the Training Primary category - Cohort

Even within the small cohort where training had previously taken place, there was still an over-riding sense that 'more was still needed': *'I felt quite confident using them but others may need more training to introduce how they work and how to use them' (T2).*

Despite the vagueness of each main categories' definitions as a unit for comparison (and is thus statistically not a significant measure), there is still a use for their quantification. For each question, the teachers gave both negative and positive responses. Overall, there was very little difference in the total number of each type of response (positive =17; negative=18). Given the comments by Makrakis (1993) and Clarke and Chambers (1989) whose data showed that there was a tendency for females to be unsure of their individual IT ability this could seem a little surprising. However, when specific areas such as those under 'self worth' are examined, we can deduce that the responses are consistent with such research: *'I have found it difficult [to integrate IT], partially because of feelings of inadequacy on my part' (T3).*

When considering the integration of IT into the classroom, it can be seen that, although various pieces of software were used, there was a feeling that true integration was not taking place - one participant stated that *'guidelines on how to incorporate ICT seamlessly into each curriculum area was still a necessity' (T1).* Condie *et al* (2005) in a review of ICT integration in Scotland reported similar findings, that “teachers were looking for staff development beyond managing the technology and, increasingly, for guidance and advice in embedding ICT into everyday practice”. Condie’s research also found that the technology training should not be ‘one size fits all’ (BECTA, 2008) but instead should focus on only those technologies and programmes to which they had access in their

schools – this personalisation of the learning was also found to be an issue by Barton and Haydn (2004).

The mixed comments by the cohort teachers show what Makrakis (1993, p191) calls negative responses to feelings of ICT competency as the "we can, I can't paradox" - as a group we are able, but personally there are difficulties. Just because the hardware targets have been achieved (BECTA 2005) does not mean that the technology has been embraced, despite a recognised need of the students by those teachers who themselves feel in need of more training. For while the education sector as a whole may take on board the initial adoption, the actions of individual adopters has the largest impact on the diffusion process (Rogers, 2003).

5.4 Interpreting the Free Response Narratives – Cohort Summary

In attempting to discover parallels between each individual member of the cohort, one can infer that T1 and T2 are similar in their generally positive attitude towards the initiative. They identify difficulties with time management of the resource (due mainly to hardware problems), would like to see more training aimed specifically at their needs and a greater level of support. T3, by contrast, was unsure about many of the ICT ideals and felt quite neglected by the support, which had only allowed her skills to improve to a very basic level. The process of incorporating IT was therefore very time-consuming for T3 and more of a hindrance than help.

5.5 The Questionnaire

In order to consider these case studies holistically, I have decided to compile both graphs and tables, so that I might present the information with clarity and concision.

Illustrative graphs can provide important information about the outcomes of a study and can be very helpful in understanding the results of a qualitative case study; however, sample size is a consideration when analysing questionnaires (Kumar, 1999; Munn and Drever, 2004). Because of the small number in the cohort ($n=3$), discussion of the results did not focus on statistical analysis - the level of confidence range would be too great. Instead, an overall consideration was given to the descriptive information provided by responses and graphical models using pie, bar and spider charts were produced. Again, because of the small cohort size, these are used as comparative illustrations rather than for significant analysis.

5.5.1 School ICT Environment

The teacher (T1) who less comfortable with her use of ICT felt that the school was only active' in some subjects while the other two felt that the school 'very active' in some subjects.

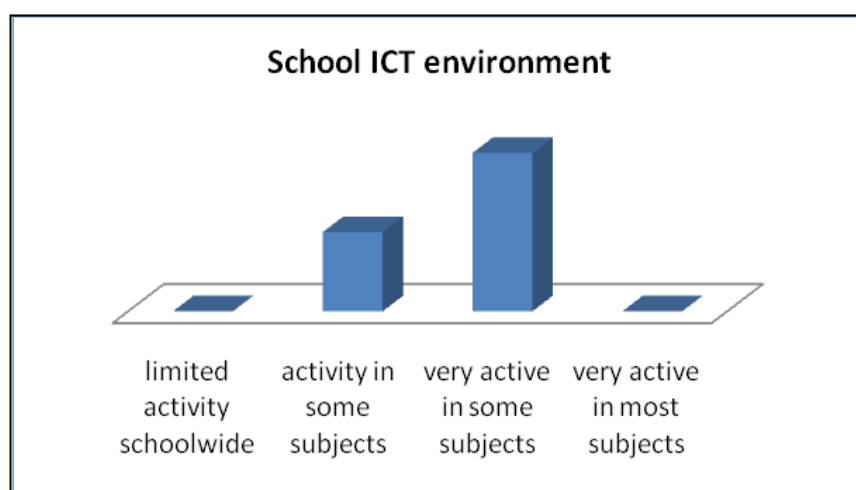


Figure 5.1 School ICT Environment

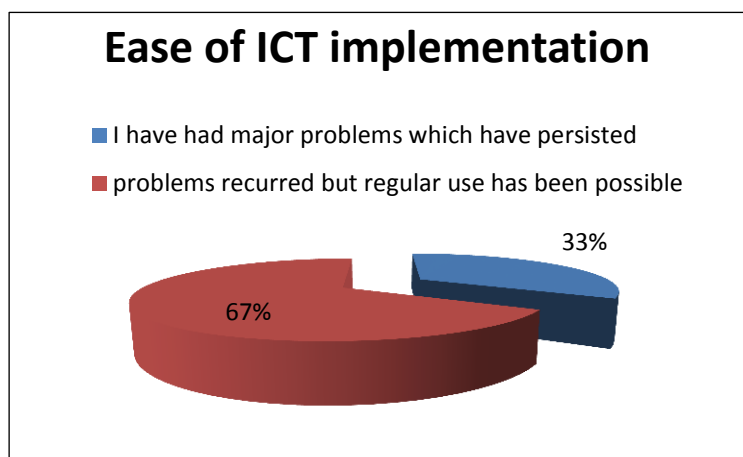


Figure 5.2 Ease of ICT Implementation

5.5.2 Ease of ICT implementation

The teacher (T1) who perceived the school was doing less well in integrating ICT also perceived that she had had most difficulties in implementing the initiative due to hardware difficulties.

With ICT, the technology is beyond most people's understanding and this is reflected in comments made concerning the ability to fix the (often minor but irritatingly time- consuming) problems. In designing CPD, a component of the training could be devoted to 'basic problem solving' at each teacher's (or groups of similar level teachers) technology level.

5.5.3 Confidence and Competence levels

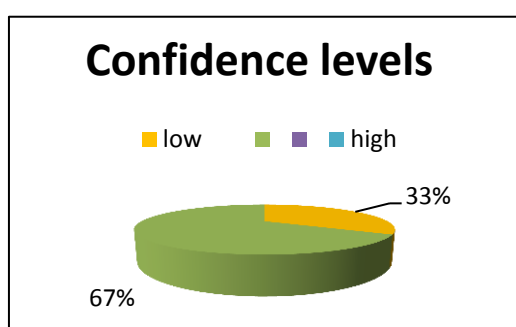


Figure 5.3 Confidence Levels

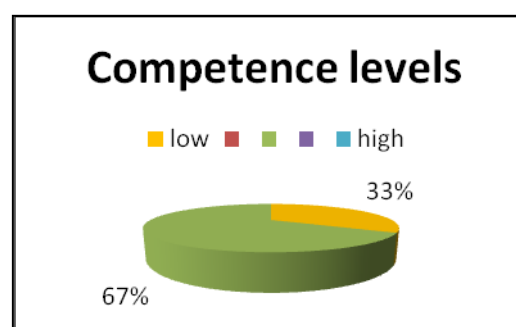


Figure 5.4 Competence Levels

5.5.4 Software Usage

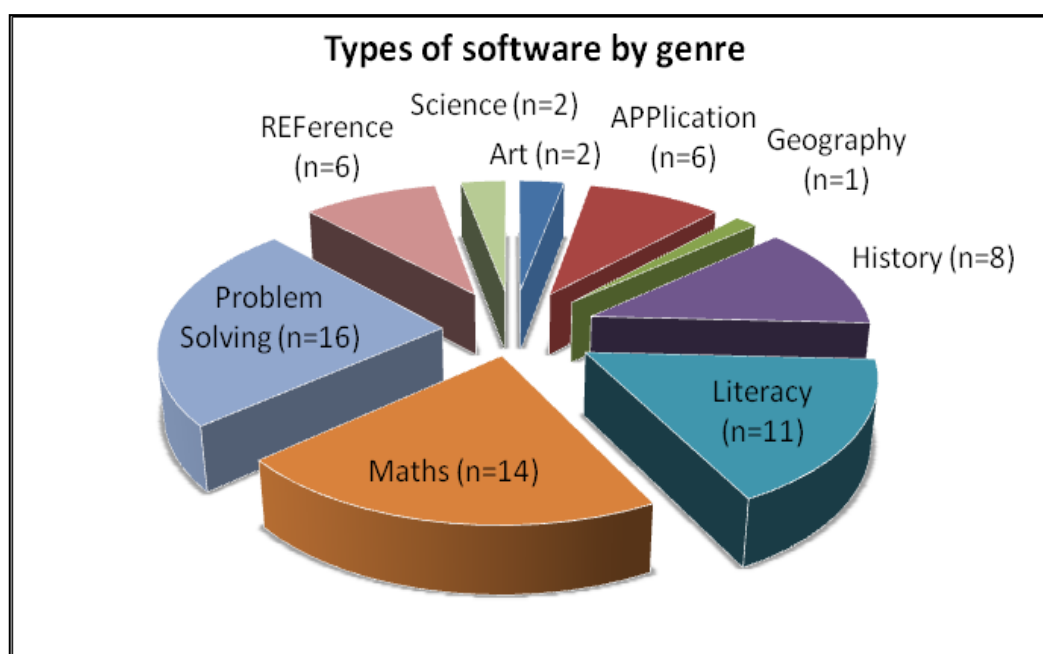


Figure 5.5 Type of software used

The feedback from the cohort showed that although there was a wide range of software genre available, the most popular uses were for skill reinforcement maths and literacy software (easy for the student to load and run) and problem solving (cross curricular software that allowed the students to apply a number of skills in various 'situations'). Whether the variation in usage was due to inappropriate software could not be determined. In line with the work carried out by Yuen and Ma (2002), it may also be that some teachers have different perceptions of a piece of software's usefulness and this may also influence their usage.

5.5.5 Personal perceptions

	Attitude designator	strongly disagree	disagree	agree	strongly agree	not sure
Positive outcomes - Teachers ('T+')						
Teachers need laptops to help them develop pupils' IT skills	T+	0	2	0	0	1
The laptop has allowed me to develop my teaching	T+	0	2	1	0	0
I was reluctant initially to participate in IT training	T+	1	0	1	1	0
I feel I am in command of IT materials	T+	0	2	0	1	0
Having the laptop has increased my enthusiasm for IT	T+	1	1	1	0	0
I have been able to help curriculum areas outside my own	T+	0	0	2	0	1
Many pupils' interest in IT has been heightened	T+	0	3	0	0	0
My use of IT has increased substantially	T+	0	1	2	0	0
I have improved my understanding of pupils' use of computers	T+	0	1	1	0	1
I enjoy introducing others to the use of computers	T+	0	1	1	0	1
On balance the project's disadvantages outweigh any benefits	T+	0	1	2	0	0

Table 5.6 Personal Perceptions – positive outcomes – Cohort

These constructs were divided into 5 sub-categories T+ teacher positive outcome; T- teacher negative outcome; S - effects on school; O- effects on others; L - effects on pupils' learning.

Again, re-stating that these graphical displays are only indicators of an overall view of the responses some trends can be seen and for the benefit of graphical clarity 'agree' and 'strongly agree' have been combined as have 'disagree' and 'strongly disagree':

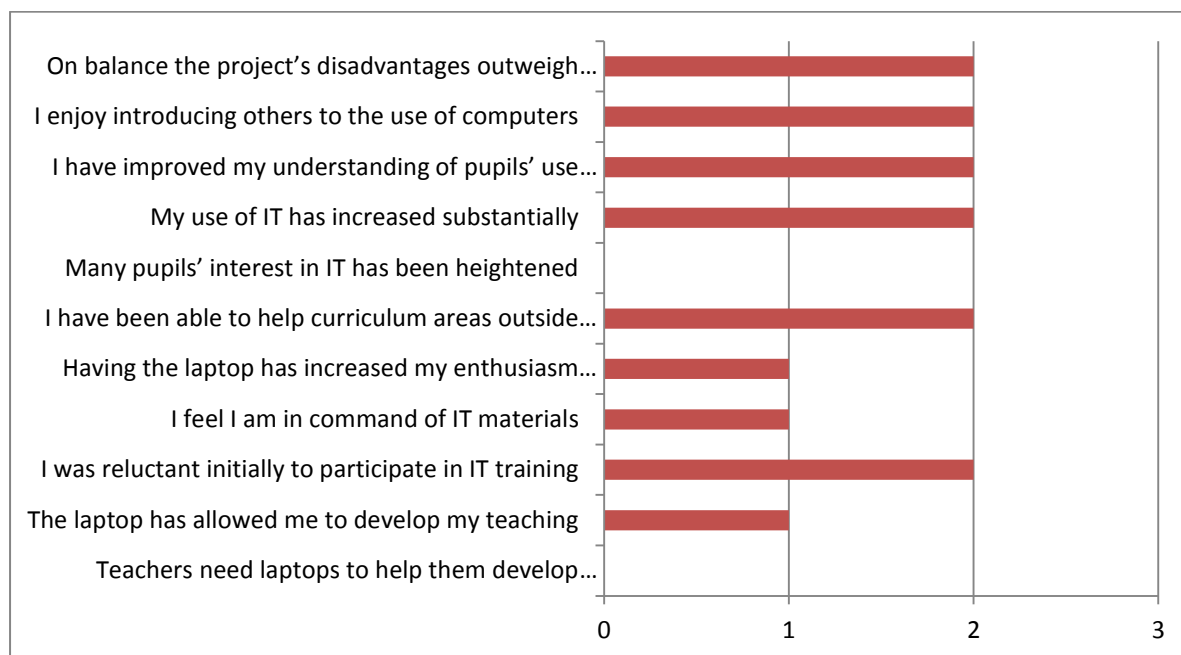


Figure 5.6 Teachers' perceptions – positive outcomes

The analysis highlights the mix off responses. It may be worth highlighting the two areas on which all the cohort agree: That they perceive that the initiative has had no influence on the children's interest in IT - how this perception has arose – perhaps through lack of update in accessing the computers at times other than directed time may be worth researching further as well as a possible match to the children's perceptions – and that individual laptops is essential for future professional development.

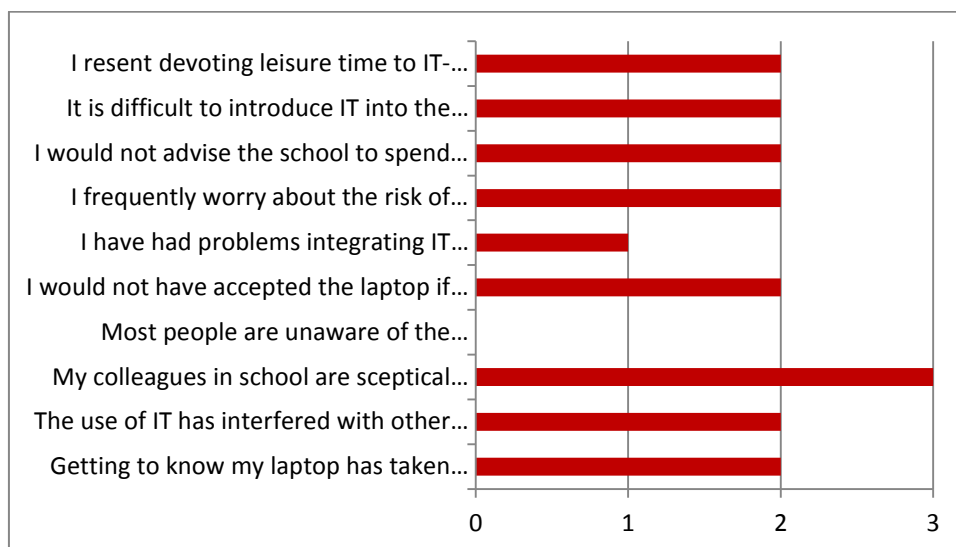


Figure 5.7 Teachers' perceptions – negative outcomes - Cohort

From Figure 5.7 it can clearly be seen that the integration of ICT has its problems. There is, however, one positive aspect – despite the cohort being unanimously sceptical of the benefits of introducing ICT the cohort did agree that people are aware of the problem. Combined with the feedback shown in Figure 5.6, there can be seen a reluctantly positive move to addressing the problems rather than simply allowing them to continue.

This quasi-positive approach is at least partly supported in the following section where software usage is addressed.

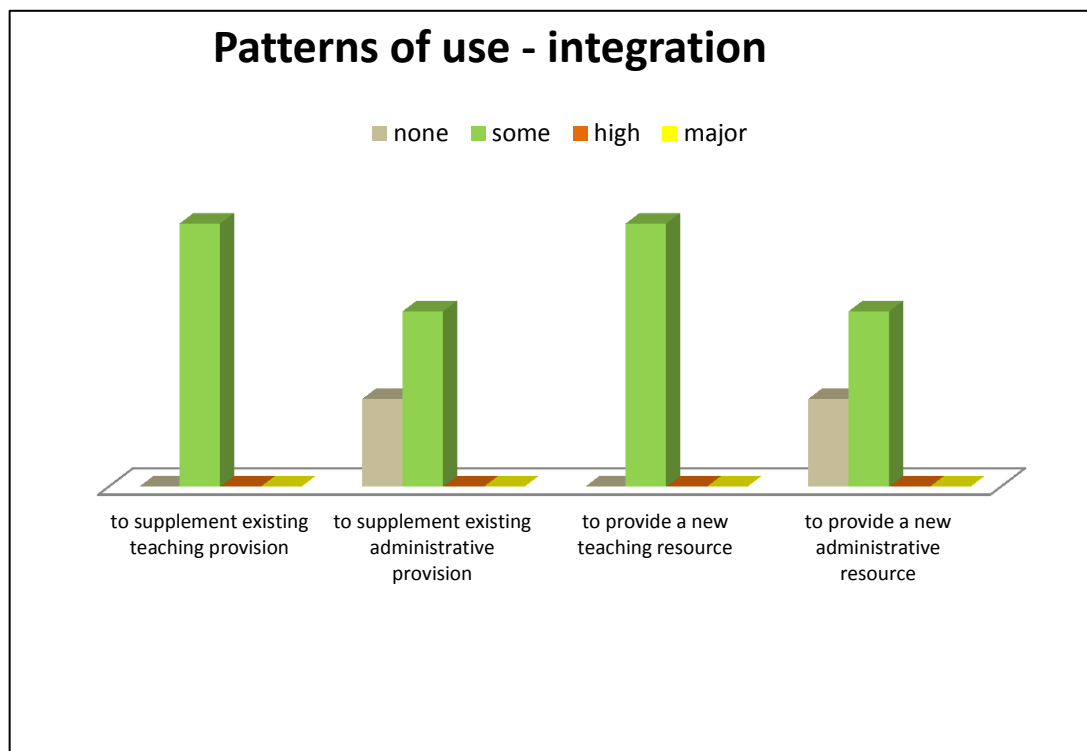


Figure 5.8 Patterns of use – integration

5.5.6 Software integration

Despite the amount of Government money and training, there was still not a significantly positive level of integration. Perhaps, as Tearle (2003), suggests we should not be looking at just the teachers and their ability (or otherwise) to change, but also that of the school organisation. This was reflected in set of constructs representing the school's overall ICT environment. In other words, there was some integration but not to the extent that there should be.

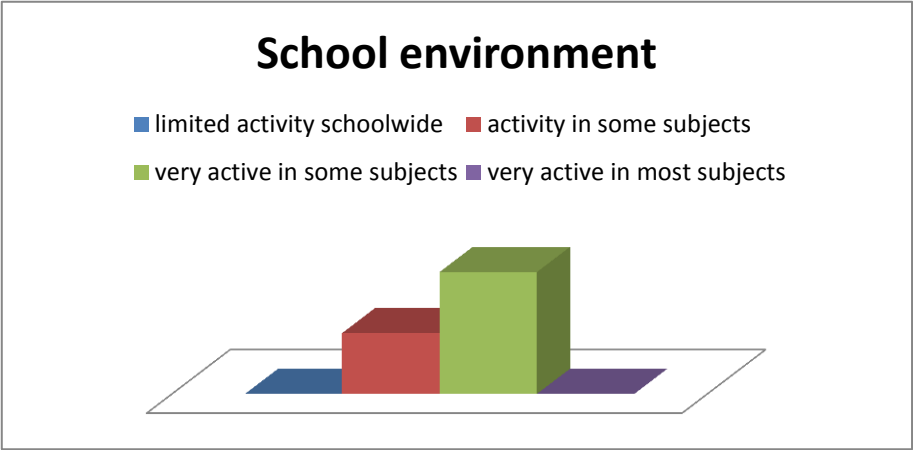


Figure 5.9 School Environment

5.5.7 Collaboration

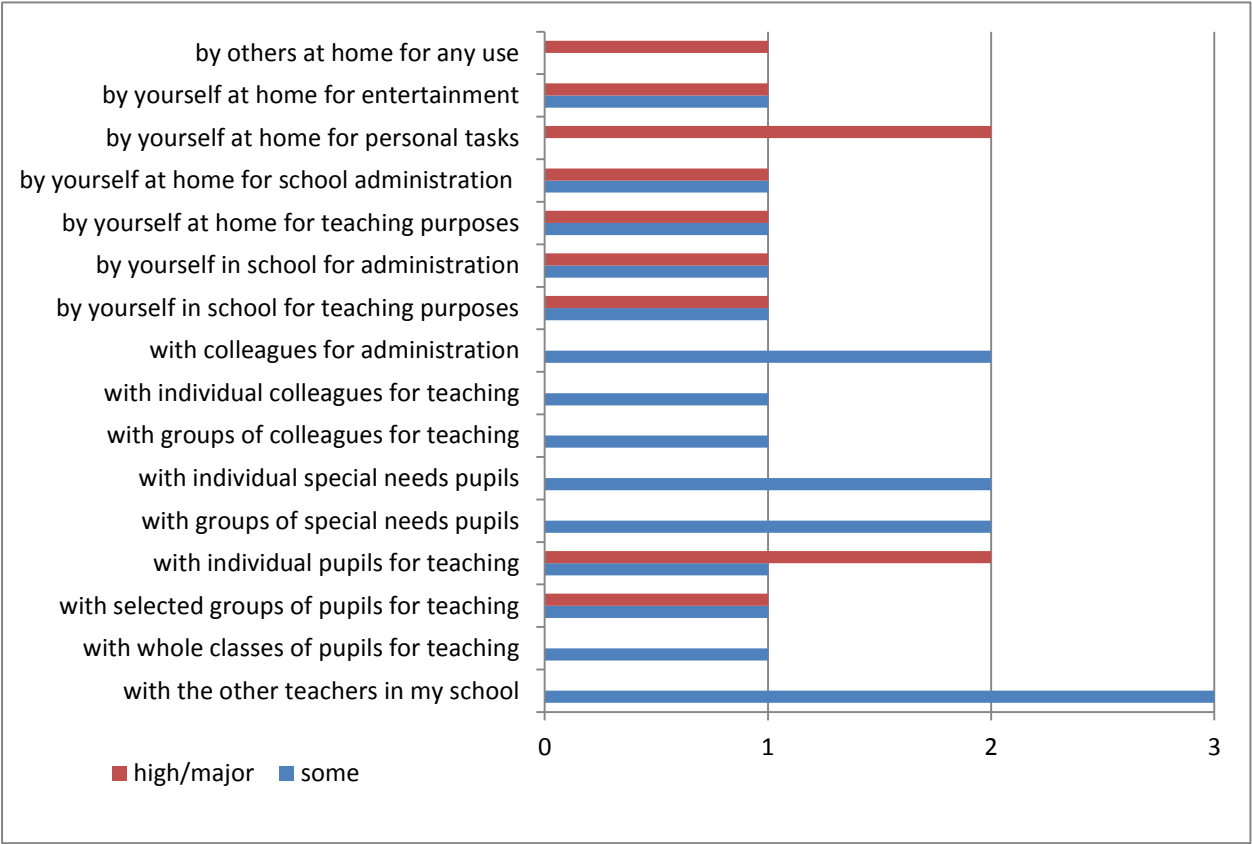


Figure 5.10 Collaboration

From the overview in Fig 5.10, it can be seen that the teachers see that ICT collaboration goes on at least to some extent in all the peer-peer areas. The one area that stands out in terms of collaboration is that with in-school peers which reflects Hargreaves' (1994, p 195) comment that "collaborative cultures...can build collective strength and confidence".

5.6 Interviews and a final overview of participants' response categories

Within the case studies I have provided a reflection on each set of interviews which refers each Teacher to each other; therefore, I will not focus specifically on this section here, but rather a final overview which also incorporates the interviews.

While sorting and classifying the emerging themes, it became evident that certain themes were common across all the informants. The tables (49 and 50) provide an overview of the common themes as well as the frequency of each theme across the informants.

Theme - positive	Occurrence
Cross curricular links/usage	111
On line researching	1
Open ended approach	1111
IWB other new hardware	1111
New use of ICT - moving forward	1111
Use of school laptop at home	111
Enjoyment by teachers	1
Advantages of using ICT for admin	111
School ethos - support	111
Interactivity	11

Table 5.7 positive comments in interviews.

Theme - negative	Occurrence
Problems with accessing internet	1
Not all children have equal knowledge of ICT	11
Loss of key people with 'knowledge'	1
No class-wide internet access	11
New hardware/software - unfamiliar	11
Infrastructure in place, but hardware not yet in place.	1

Table 5.8 negative comments in interviews.

The responses varied but there were indications of frustration between what the teachers expected to do and what the technology allowed them to do:

"I would have liked to have had internet access for everyone, but in the end didn't have"

"[child's name] had not correctly saved his filesbut ...was able to recreate the files quickly" and "there were problems with the laptops... sometimes the internet doesn't work on them...sometimes the laptops hadn't been charged". This frustration with the equipment decreases the level of confidence in the technology and the teacher's ability to cope with the breakdowns (Cuban, 1999).

Recorded conversations which preserve the children's interaction with each other and the teachers predominantly centred around the specifics of using the technology, rather than on developing the child's ability to carry out the work:

T1: Can you hop up for a second; this program is a bit temperamental at times. Have you closed it? You closed the story?

(...)

Oh, that's interesting. So it's associating it with the wrong file type.

These comments, in general, were in the minority but reflect what Shortis (2001) has found in other professions – that the teacher often sees the computer operating system, the programme or other hardware anthropomorphically. In this case, the teacher referred to the programme as being ‘a bit temperamental’. By attributing such human-like qualities, the teacher tries to lessen the frustration of the moment by implying that the next time it will work; often this is articulated in front of the students so that they don’t feel either ‘let down’ or acquire a cynical approach to the reliability the ICT systems. This may well prove an interesting area to pursue further – how students’ attitudes to ICT are affected by the methods with which teachers combat their frustrations arising from technological issues.

The majority of comments, however, extolled the upsides of the technology from independent research using the enormously wide resource bank found on the internet (*“I believe very strongly that the Internet is an incredibly valuable research tool. It has loads there providing you’re capable of using it with some discernment”*), to the fact that the multi-media interactive resources helped in keeping the children's focus (*“I think having research tools that are loaded that you can use off line for the kids to use is great”*). OfSTED (2005) found this also to have some truth in their wider study that showed that teachers’ competence and confidence has improved in using applications, but they also had a tendency to stay with familiar and consistent software.

There were a few comments linked to confidence:

"it's encouraging being in an environment where all the other teachers [are] using it [ICT] confidently"

"[colleague's name] won't be there next year and that makes a difference, so next year will be more difficult."

This latter causes some concern (BECTA, 2004) but is not insurmountable.

Research from the interim findings of the Teacher Workload Study for the then DfES (Price-Waterhouse-Coopers, 2001) found that teachers who were given laptops to take home ended up making more use of ICT while Guha (2000) had feedback in her research to show that teachers using computers at home had less fear of using them. This was reflected in comments from this study's cohort where using the laptops at home for planning and familiarisation was highlighted as a positive move forward on the confidence front - *"I do a lot of my work at home, and it's much, much easier"*. This factor could help to account for the higher positive responses than expected using the mind maps.

An approach to helping these teachers may also be through what Laurillard (2008) highlights as 'personalised learning'. Involvement in developing a personal digital portfolio can lead some teachers to move swiftly from a position of non-user to mentor of others (Kankaanranta, 2001). Publishing these digital portfolios on the Web could enable a sharing of pedagogical expertise and practice (Kankaanranta, 2001), while sharing problems and success via a discussion group could give members the confidence to reflect on practice in their own schools (Parker and Bowell, 1998).

In any diffusion model, the assumption is that individuals adopt the innovation for their own use rather than as part of the larger group. Providing 'critical mass' (Markus, 1987) is reached, the technology will be adopted (Rogers, 2003). In the responses from the case study participants, it can be seen that although some individuals were ready to adopt, not all were, and the 'critical mass' was

not achieved. Confidence in the technology played an important part in the lack of progress, in addition the technology was not intertwined with what Nelson and Winter (1982) called 'organisational routines' – using ICT for data handling, internal emails and other forms of routine teacher administration – and this might also be a factor worthy of future examination.

Chapter 6 DISCUSSION OF FINDINGS AND THEIR RELATIONSHIPS TO EARLIER STUDIES IN THE FIELD

6.1 The Research problem

Research highlighted in previous chapters has shown that generalizing from a case study is often problematic. Although the data returned from this small cohort case study could be considered too disparate or lacking substance, Yin (1994) states that in such case studies we should aim towards analytic generalization and avoid thinking in such confusing terms as "small sample size of cases". The choice of a combined qualitative and quantitative approach seemed to make sense - try to use as many sources of input to achieve what could be triangulated to a more general view. Time restraints and teaching and administrative commitments and an unexpected change in the cohort staff (earlier than anticipated retirement) meant that although the case study data may not have been as robust as would have been liked, nonetheless, it did give an unexpected insight - that, overall, despite reservations and hardware problem, teachers do attempt to be positive and to assimilate technological changes as best they can.

There are a range of different aspects to the successful diffusion of an ICT initiative. These include lack of time (Eifler *et al*, 2001; Wepner *et al*, 2003), technological skill of the teachers (Eifler *et al*, 2001; Strudler *et al* 2003; Thompson *et al*, 2003), fear of technological problems (Bullock, 2004; Doering *et al.*, 2003), a lack of clear understanding about how to integrate technology into teaching (Cuban, 2001), and insufficient access to technology (e.g., Bartlett, 2002; Brush *et al*, 2003; Russell *et al*, 2003). In addition, the over-riding impression is very much that bespoke Continual Professional Development (CPD) is what is required, which is consistent with the findings of Condie

et al (2007) who stated that teachers preferred “training that addressed their specific needs, rather than ‘one size fits all’ approach” and Davis *et al*, (2008) who also found that distance learning (again of the New Opportunities Funding – NOF- generic type) “was particularly ineffective for teachers who started without skills and confidence in ICT” (p12).

When addressing the ICT CPD needs of the teachers, there is a strong need to understand the place of emotions and to develop them towards a positive goal – one of the core ingredients of ‘emotional intelligence’ (Goleman, 1998). Because learning often takes place close to the emotional point where challenge may tip into threat it is important that CPD providers understand the necessity of emotions in the context of ICT learning. Schools initiating change involving ICT are very definitely what Fineman (1993) calls ‘emotional arenas’ where “[emotions] are usually talked about only insofar as they help administrators and reformers ‘manage’ and offset teachers’ resistance to change” (Hargreaves, 1998, quoted in Day and Leitch, 2001, p10) a view which Goleman (1998) says is “sadly short-sighted”.

In all of the initiatives, the process of change is an obvious, recurring theme. There is no right or wrong theory to change management, each CPD leader must pick and choose from a number of different approaches to lead the change effort effectively. In taking all the above into account, alongside literature discussing similar findings, it is hoped that consideration of the effect of a small part of ICT diffusion can lead to further research and a more improved provision for successful ICT CPD.

6.2 The Role Of Emotions In ICT CPD

The term ‘emotions’ is not considered here as linked to the sole need to respond to a particularly sad scene in a film; yet “understanding the emotional life of teachers, their feelings for and in their work, and attending to this emotional life in ways that positively cultivate it and avoid negatively damaging it, should be absolutely central to teacher development efforts” (Hargreaves, 1995, p21).

Responses in this case study such as

I felt quite confident using them [computers] but others may need more training to introduce how they work and how to use them.

and the literature research (eg Hargreaves, 1998, Day and Leitch, 2001) shows that this is an important factor in considering how to develop teachers. The question arises as to why it did not seem to have been given serious consideration when developing the NOF strategy – the government’s main thrust in providing training for the integration of ICT. Even though there were organisations willing to take the bespoke approach on board, only those in the ‘Red Folder’ (list of approved CPD providers) could be used and theirs were seriously devoted to rationalizing, intellectualizing, or worse still, ignoring the teachers’ emotional relationships with what they do and how they see change affecting their pedagogy. Such approaches to reforms, as has been highlighted in a recent review of the New Opportunities Fund (NOF), one of the earlier initiatives (Conlon, 2004), had been shown to fail and there is mounting evidence to suggest that had more account been taken of the ‘whole teacher’ – where s/he works and the culture of their teaching - there may well have been a better initial response to this innovation (Lawless and Pellegrino, 2007; Davis and Thompson, 2005; Sahin and Thompson, 2006; Loucks-Horsley and Bybee, 2000)

When faced with the unknown, often the choice is ‘fight or flight’. Whether to participate and take on board a new initiative or whether to resist and deny the initiative is governed to a great extent by past experiences and their emotional responses to these experiences. Teachers are used to being the 'giver of information' rather than the facilitator of information. Current CPD provision for IT reflects this pedagogical approach. But teachers need a different kind of support and training to integrate IT than they would for, say, mathematics, where there is less reliance upon technology (Planow, 1993). Such IT training programmes must not only be designed for teachers to improve their skills but must also help them change their emotional attitude to the technology in order to ensure they use the technology – to ‘fight’ and engage and learn.

In order for this to happen, CPD providers need to have some background knowledge of the teachers for whom the CPD is being organised. Such knowledge, according to Goleman (1999, p137/138), can be acquired through:

Understanding others: Sensing others' feelings and perspectives and taking an active interest in their concerns.

Service Orientation: Anticipating, recognising and meeting customers' needs

and Developing others: sensing others' development needs and bolstering their abilities.

Recognition by the CPD providers that learning often takes place close to the point where the challenge may lead to ‘flight’ means that they also need to recognize the value of teachers’ emotions in the context of learning.

6.3 Impact Studies

In comparison to the introduction of the National Numeracy (NNS) and Literacy Strategies (NLS), the rate of diffusion for ICT integration has been slower and assessing its effectiveness has been problematic. Even though research (DfES 1999b, 2000b), is questioning the overall effectiveness of the NNS and NLS programme on the standards of achievements (often considered to be the only benchmark against which to measure a new initiative) there is evidence to show that the NNS and NLS have had some considerable impact on standards. There are no studies which can reliably show that the ICT innovation is having an effect on the levels of achievement in all areas of the curriculum. As Balanskat *et al*'s (2006) European-wide study showed some areas are more impacted than others but there is still a lot of contradictory evidence. Comments such as

...clearer guidelines on how to incorporate ICT meaningfully in particular curriculum areas are needed.

best highlight the need to have a more consistent approach. Maybe it is a case similar to the metaphor of the 'hare and the tortoise' in as much as the ICT innovation has been slow to take off and rocky in its introduction, but is now showing signs of achieving what was originally imagined.

6.4 The Role Of Change Theory In Successful Initiative Implementation

Successful change, according to Fullan and Miles (1992, p749) "involves learning and that all learning involves coming to understand and to be good at something new". Although change is an area that can be studied in great depth on its own, nonetheless, some acknowledgement to its impact in comparison to this case study is required.

Organizations don't change unless the individuals do - no matter how large the education initiative being taken on (and ICT diffusion in schools is very big!), the success of that project ultimately lies with each teacher doing their work differently, multiplied across all of the teachers impacted by the change. In the case study this is highlighted in how one of the teachers responded to the various questionnaires and mindmap tasks and her comments: *concern that computer technology will take over completely; find it difficult to retain instructions – almost like a foreign language* and, possibly most indicative, *need to approach it on my own terms (T2MM)*. This comment supports other work (Ehman *et al*, 2005) that highlights the need for focusing the CPD intentions in a way that is meaningful for the teachers individually.

Effective change management requires an understanding for and appreciation of how one person makes a change successfully. Huberman (1988) found that older teachers were not only more resistant to change; they were also less likely to believe that it would work:

The growing impact of ICT in schools has left me teaching in its wake.

Children learn interactively and pleasurably by using ICT and it is of great use in lightening the administrative load, but I have reservations about the extent of its use in school today.

Feeling of resistance to most technology.

Many of the best writers still insist on writing in longhand.

Something new is always coming along and I'll never be able to learn it all, so I don't see any point in trying.

Authentic change occurs when a teacher's belief system and core values concerning teaching and learning are modified. In order for authentic change to occur, teachers need the opportunity to learn

new information, time to experiment with the new concept, and the opportunity to evaluate its effectiveness (Levy and Murnane, 2004; Richardson, 2003) this change is a highly personal process accomplished by the individual through experiences, emotions, cognitions, and behaviours over a period of time which transform a teacher's values and beliefs (Treacy *et al*, 2002; Prochaska *et al*, 1993).

This process of change assumes the teacher recognizes a need, makes plans to improve, engages in the improvement, and allows time to evaluate the effectiveness of the new practices. In the case of the experienced teacher discussed above, the process of change is far from over – resistance to change can be seen in terms of the experienced teachers' unwillingness to change her teaching practices (Snoeyink and Ertmer, 2001) and a perception that technology does not enhance learning (Yuen and Ma, 2002; Preston *et al* 2000): *I enjoy manually cutting and pasting my own pictures to make worksheets more interesting – why would I want to spend time scanning and electronically cutting and pasting – my way is easier and more reliable*. Because this teacher does not realize the advantages of using technology in her teaching (easier to edit a document electronically, for example), perhaps a way forward would be to initially tailor specific CPD to what she enjoys best – adding interest to her worksheets and moving forward from there? Interesting, although there is some research that shows that age does not affect ICT up-take (Bradley and Russell, 1997), in this case study, it was the younger teachers who most keen to try integrating ICT while the more experienced teacher (discussed above) was reluctant to be an adopter; this teacher had also declined to be involved in the early adoption of the Laptops For Teachers initiative where teachers were given their own laptops to work with at home and school – factors influencing one barrier often affect other barriers to ICT diffusion (Jones, 2004).

To help with the change at each individual's level, Caplan (1964) and Mechanic (1967) show that one of the major support mechanisms is coping behaviour. "Change in the classroom which involves more than extending the repertoire by acquiring new skills will mean changing attitudes, beliefs and personal theories; a reconstructing of a personal approach to teaching. CPD therefore needs to provide new experiences, support the anxieties which accompany not just the threat but the genuine difficulties of change, and give people time to reflect, work things out and think things through" (Steadman, *et al*, 1995, p49).

There are many lessons to be learned here; one can certainly be found in the evidence that small, positive changes – established in order to overcome one barrier - will have a knock-on effect on other flawed areas: "we really should not be surprised", according to Whittaker (1993, p156), "at the capacity of small incidents and events to create turbulence. In fact quality is built on the idea that excellence resides in sensitive attention to the small but significant aspects of change". The feedback from the case study cohort reflects this - if the teachers have difficulty working with the hardware, then that frustration will manifest itself in frustration with the innovation but if the teacher sees beyond this frustration to its ability to enhance the children's learning experience then that is one small step towards a fuller diffusion of ICT.

There is a general consensus from the literature research and from this case study that the diffusion of ICT has not been as successful as it was first hoped to be. This gap in 'value added' is not uncrossable. Those teachers in the study who were attempting to integrate ICT found that the internet was one of the most powerful tools for their children's learning. Coupled with the introduction of the interactive whiteboards, this a combination which would seem to lead down a path for more

integration – providing the hardware/internet connection was reliable. As stated earlier, though, just because the resources are in place does not necessarily mean that the ‘ICT is well integrated’ box can be ticked. This is obviously not enough. What is needed is an individual-level training approach that focuses on one aspect of ICT and concentrates resources and CPD to this area and enables teachers to support and enrich the curriculum; a commitment to involve all members of the staff, taking into account individual’s experiences, emotional levels of commitment and a willingness to take risks, accepting that not all projects will succeed.

6.5 Visual Metaphor Model For CPD And ICT Integration.

In order to understand what change such as the introduction of the ICT initiative means to the teacher in the classroom, it is necessary to understand how it impacts each teacher. The case study has highlighted the role of emotions especially given the number of teachers in a small school such as this case study’s.

In order to get some kind of overview of how CPD, individualization and ICT diffusion fits together, a visual representation often helps.

A metaphor is usually understood in a verbal context; specifically as a figurative literary device. A *visual* metaphor is a graphic that uses the shape and elements of an easily recognizable form to explain something that can be more complex. There is a small body of literature outside the fields of

psychology and ICT that has described this interpretation of visual metaphors - in education (Goldsmith 1984) and in graphic design (Richards 2000).

Graphs constitute a class of visual metaphor that has been so long established that it can stand alone without any explanatory text. There has been much research on the use of graphs in terms of interpretative behaviour (Zacks and Tversky 1997, Carpenter and Shah 1998) and some of these studies have provided practical advice about when to use graphs in presenting research results (Carswell and Ramzy 1997, Shah and Carpenter 1995). Although Cooper, in his 1997 article titled “The Myth of Metaphor”, considers that the search for a good visual metaphor is essentially counterproductive, nevertheless there is still an argument that "as a modelling idea, the metaphor orientates the learner to totality... it involves a connection between visual image and concept" (Fichtner, 1999, p323) As the transfer of knowledge can be difficult to manage (Burkhard and Meier, 2004), the use of a visual metaphor can be used to improve the process (Eppler, 2003).

As such, then, the use of a three dimensional graph metaphor (Figure 6.2) offers the ability to show ‘the totality’ that teachers’ confidence in using ICT, the level of CPD individualization and the integration of ICT into the curriculum are dependent upon each other.

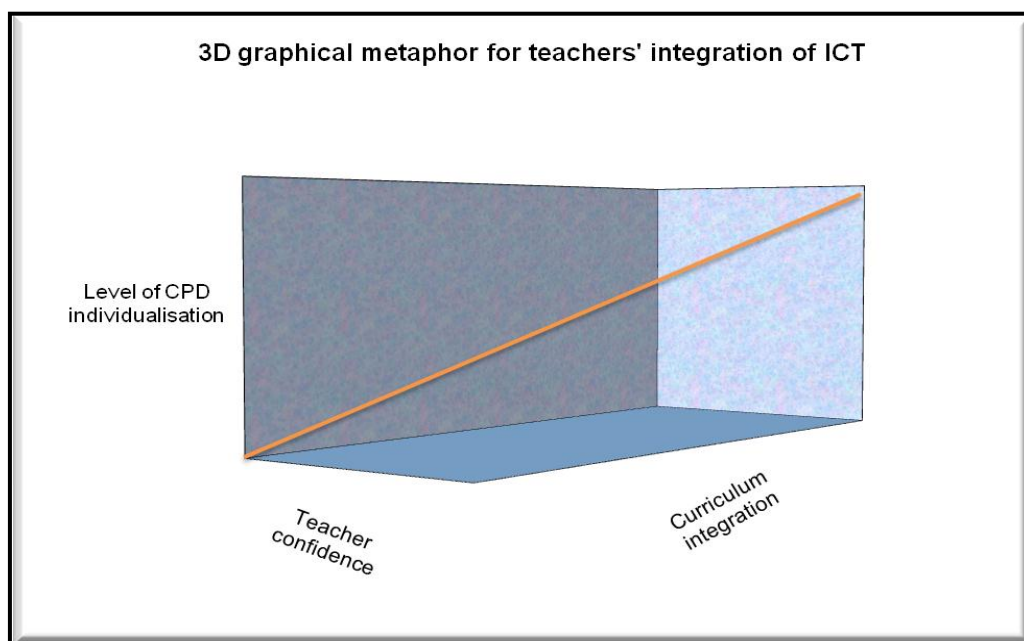


Figure 6.2 3D graphical metaphor for CPD, teacher confidence and the integration of ICT

The purpose of designing such a model is to give a clearer representation of what effect consideration of teacher confidence and, hence, the individualization of the CPD programme has on effectiveness of ICT diffusion into the curriculum. It is not possible to change one aspect without affecting the others. The objective of the CPD was to have ICT seamlessly integrated into all aspects of the curriculum; the effectiveness of this imposed change is dependent upon each individual and there is research (Sikes, 1992; Huberman, 1988) that shows that not only are experienced teachers more reluctant to change (especially in regards to technology) but that this is particularly the case with older women. The importance of taking account of these individualised views cannot be over-emphasised; the part played by 'emotional baggage' should be at the forefront in any CPD.

Chapter 7 BUILDING THEORY FROM A CASE STUDY: SUMMARIES AND CONCLUSIONS

7.1 Building Theory from the Case Study

The research concept first arose from working in a school where there was a small cohort of colleagues who struck me as representing what would seem to be an ideal cross section of ICT adopters. This was highlighted through many staff room coffee discussions on ICT, the one common theme becoming apparent being linked to feelings of confidence about the whole area of ICT – hardware, software and, especially, teaching and learning. The intention was to ascertain whether a closer study of the reasons for this concern amongst this group of teachers (a ‘case study’) could be extrapolated into a premise that could reflect the views of teachers in general, beginning, as Eisenhardt (1989) suggests, “as close as possible to the ideal of no theory under consideration and no hypothesis to test” (p536) .

Case study research to build a theory is well documented and has taken many approaches (Glaser and Strauss, 1967; Stake 1995, 2005; Yin, 1994; Pettigrew, 1988; Mintzberg, 1979; Mintzberg and McHugh, 1985; Jick, 1979, Barone, 2004). By choosing a small cohort school with a population that appeared to span the range of IT adopters from 'early' to 'late' to 'laggards' (Rogers, 2003) the research allowed for what Yin (1994) calls an ‘analytic generalisation’ (a generalisation more concerned with the interaction of factors and events). This re-focusing took the emphasis away from obtaining accurate statistical evidence and moved it to giving a more in-depth consideration of what specific barriers there were using multiple data collection methods.

As the research progressed, then, Eisenhardt's ideal was refined down to four research questions:

- What part does teacher confidence play in the integration of ICT into the classroom?
- What has an impact on this confidence?
- What implications does this have for continued professional development (CPD)?
- Can we model the case study into a proposal to help other teachers?

Although the outcome of this research in the area of education was supported by some generalisations for ICT diffusion in the business arena, this case study did not lead to any new generalizations. Nonetheless, in line with Stake (1993), by using a combination of qualitative and quantitative data, this study allowed for the corroboration of findings, explaining some relationships between the data and the thesis questions.

What part does teacher confidence play in the integration of ICT into the classroom?

From comments by all the cohort members in many areas of the research, the confidence level was high on their thoughts.

When asked about confidence in using the equipment T1, a relatively ICT literate teacher, said she still felt that she had to improve.

Teacher 2's lack of confidence could be attributed to the fact the IT environment is perhaps more pressured in this school – the school is very active in some areas of IT – which makes her major problems with IT (problems which have also persisted) all the more evident.

Although one of the teachers did not embrace the change, the others showed not only willingness but also instinctively seem to recognise the need to work together for support and confidence-boosting; effectively running their own CPD amongst themselves, showing that the change is most effective when carried out by a "cross role group" (Fullan and Miles, 1992) who can support each other as well. Colleague support was obviously considered required scaffolding to help teachers' confidence:

"it's encouraging being in an environment where all the other teachers [are] using it [ICT] confidently"
"[colleague's name] won't be there next year and that makes a difference, so next year will be more difficult."

Teaching has a range of levels of adoption in all new initiatives, but if due consideration is given to the range of this study's cohort's abilities, then it is possible to say that in any larger group, a similar spread will be evident, as will the responses.

What has an impact on this confidence?

In addition to the cohort teachers showing a positive attitudes towards ICT integration, there were indications that integration of ICT into the classroom, though not always successful, was considered appropriate and that ICT should be integrated with all curriculum areas, that it is important to provide students with a variety of uses of ICT and that CPD is a main area for consideration in the implementation of effective ICT integration.

Within the case study, the teachers' perceived obstacles to classroom ICT integration align with other studies. The teachers' responses in the data collection show a diverse range of needs from technical support in the classroom to assurance about the reliability of the resources - the participants indicating that access to reliable hardware, software, technical support, and guidance in effective ICT integration strategies impacted on their ability to integrate ICT from support from each other to support from the school leadership.

The study indicates that there is a link between teacher's attitude and their perceived level of skills when using ICT and, although the response to generic CPD was not positive, there is a positive

correlation between bespoke professional development and teacher's attitudes towards ICTs supporting the findings of Clark (2000) and Ertmer *et al* (1999). (See Figure 6.2).

The use of laptops provided to each teacher (and reported by the cohort teachers as being a key factor in aiding adoption) was an enabling factor, supporting other research highlighting the need for teachers to experiment and gain confidence in their own time (Harrison *et al*, 1998).

The case study teachers had experienced a number of substantial changes over the previous years. This number of changes may easily had led to an ethos of 'Why again?' but instead had drawn the team together and shown that there was certainly a spirit of adaptation and willingness to take on board innovations with each other (see Figure 7.1 showing the spike for collaboration amongst the cohort members).

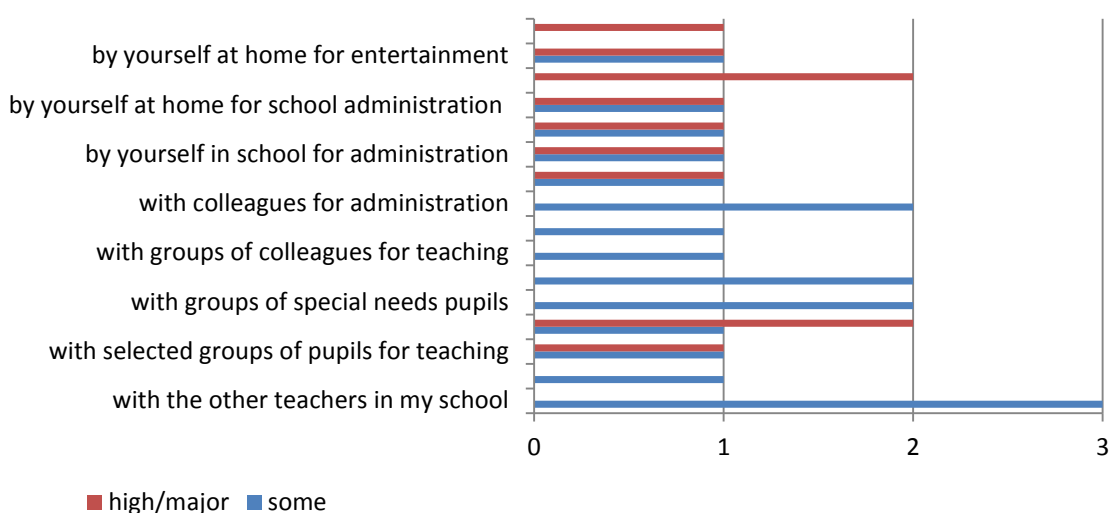


Figure 7.1 Patterns of collaboration

Schools whose culture is 'collaborative' are those that can take on board innovation and succeed (Fullan and Hargreaves, 1992b) by giving confidence to each individual member. In line with

Rogers' (2003, p221) assertion that big organisations can only take on change quickly if the size of the decision-making group is small, indications from this case study suggest that that is the case. It seems from this case study that it is just the size of the staff but how they are trained, time allocation for 'experimenting' to build confidence and respect for the emotional aspect of each individual are more important than faculty numbers. A small cohort has communications channels that are both tight and highly interconnected and thus enhance the sharing of knowledge and skills (Beebe and Masterson, 2008; Cragan *et al*, 2008) and it takes account of each member's level of confidence.

This sharing of knowledge was highlighted amongst this small cohort. For one teacher it can be clearly seen that the problem was 'late arrival to the table' in as much as she was nearing the end of her teaching career and, although her colleagues were to help see the need for the technology innovation as far as the students were concerned, she could not see herself taking on board the innovation. The other teachers, however, had been taking the innovation on board but the effective embedding of the technology was being hampered by hardware glitches which, although often small, were building up into a major frustration that prevented a more seamless integration, by lack of time to experiment with the technology and by lack of 'ground level' training specific to their needs.

Can we model the case study into a proposal to help other teachers?

The National Numeracy and Literacy Strategies had been well received and had been successfully implemented. These were strategies which covered familiar ground, were controllable and the generic training was usable as it dealt, fundamentally, with the children and with different approaches with familiar resources. The ICT innovation has proved to be a different change. Now, technology that was not easily understandable and was not consistent (eg: "*why would it print the*

document yesterday but not today?”) was being implemented. The teachers were feeling very much that, though the need for the change was understandable, they were dealing with a resource about which they had no real understanding; overhead projectors didn't work because the bulb had blown which was physical and was within their realm of everyday experiences, but loading programmes, finding files on hard drive and dealing with connecting computers to the internet was not, and the school was not large enough to add a technician to be able to come in during a lesson to fix the problem.

This 'rate of adoption' of any innovation is influenced by five attributes: *relative advantage* - whether the innovation is perceived as being better than what is already in place; *compatibility* - how is the innovation consistent with past experiences and knowledge and, more importantly, the needs of the users; *complexity* – the degree to which an innovation is perceived as relatively difficult to understand and use; *trialability* - do the participants have time to understand and experiment; *observability* - can the participants clearly see the results and the number of persons involved in the innovation - ie the more that are involved, the slower the rate of adoption (Rogers, 1995 and 2003). For the teachers participating in the study, a summary table (Table 7.1) is shown below based on their responses in the questionnaires, mind maps and interviews.

Innovation Attribute	T1	T2	T3
Relative advantage – is it better than what was in place?	4	1	4
Compatibility – is it consistent with past experiences?	5	1	2
Trialability – do you have time to experiment?	3	1	3
Observability – are the results and people involved clearly seen?	4	3	4
Complexity – is it difficult to understand and use?	1	5	3

Table 7.1 Attributes of Innovation for the cohort teachers (after Rogers, 2003) (1 disagree, 5 agree)

Each teacher came to the initiative with their own background. One member, for instance started her career in the IT department of a large national bank; one was a very experienced teacher, close to retirement while the third was the youngest and the only one with some pre-service ICT training at university. This range of backgrounds can be seen in the scores for the compatibility attribute while the other scores reflect the areas previously discussed in this chapter – namely that there is a consideration that there is a relative advantage to the ICT innovation, though not enough time to experiment (the middle score being linked to the use of laptops by T1 and T3) and that although they can all see the people involved and can see some results, they are not all agreed that it is better than before.

In 1973, Zaltman and colleagues published "Innovations and Organisations" in which they stated that the main dependent variable in the introduction of an innovation was not the decision to introduce it but, rather, its implementation; it is, as Healey and De Stefano (1997) argued, not the replication of the idea for the innovation so much as the replication of the conditions that made the innovation successful in other schools.

From this study, then, the following findings can be highlighted that could be considered for similar such initiatives and applicable for a more 'analytic generalisation':

- Working with generic training with an emphasis of individuals working through manuals was the worst of possible scenarios to ensure the success of the initiative.
- Small cohorts from the same school were the most effective method for both professional development (because all the members are aware of the needs of cohort member) and in encouraging colleagues to 'try things out', leading to a better rate of adoption. Research by

the likes of Abbott and Faris (2000) help to give further credence to this approach - giving us clear indicators that reforms based upon assumptions of uniformity in the educational system repeatedly fail.

- Change causes anxiety and uncertainty. This 'emotional intelligence' is part and parcel of any change (Goleman, 1998) and "people fail to adapt because of the stress provoked by the problem and the changes it demands" (Heifitz, 1994, p37). The government, in their NOF training, thought to use the approach of replicating the training exactly for each teacher and have them carry it out by themselves (see Kirkwood *et al*, 2000). In fact, what was needed was bespoke training for either individual schools if they were small enough or small groups of teachers at similar levels of emotional anxiety and stages of adoption - 'early', 'late' or 'laggards' (Rogers, 2003) - "because *each* (original italics) local situation, to a certain extent, will be unique and will need to develop differently" (Fullan, 2000b, p66).
- One of the inhibitors to diffusion has been lack of confidence – whether it was in the hardware, connections or own ability. Although in industry this lack of confidence is the most cited reason for lack of effective ICT integration (Howard, 1997, Matthews, 2007, Harindranath *et al*, 2008), there is no similar current research with teachers. Some of this anxiety can be alleviated by:
 - Having access to reliable hardware, software and technical support.
 - CPD for ICT innovations should have a 'human face' - start from the needs, wants and aspirations of the teachers when designing the CPD programme.
- Specific guidance in effective ICT integration strategies has a very positive impact on teachers' ability to integrate ICT.
- Diffusion, according to Everett Rogers (2003, p5) is "the process in which an innovation is communicated through certain channels over time among the members of a social system. It

is a special type of communication in that the messages are concerned with new ideas.

Communication (original italics) is a process in which participants create and share information with one another in order to reach a mutual understanding". This study and other research into diffusion has shown that anyone involved in the introduction of an innovation does not make instantaneous decisions about its usefulness; rather, the decision process takes place over time.

The case study was unable to show what Yin (1994) called 'revelatory' insights, nor was it able to be a 'critical case' - "a single case meeting all the conditions for testing a well-founded theory". (Yin, 1994, p421). Instead, this study was able to show that by carrying out work with a small cohort, it was possible to build on previous theories that showed that implementation of change was not just dealing with the process but also with the attitudes and 'emotional intelligence' - the human interface side of diffusion of an innovation.

7.2 Outcome from the Study

By taking some of the comments outlined above into account when looking at the demographics of a school, the change agent could more effectively target individuals or groups with specific emotional scaffolding techniques. Without taking into account this individual perspective, the change agent will be left with activities but no idea of the goal or outcome that they are trying to achieve. If we start with Schein's (2006, p1) proposal (based on the work of Kurt Lewin) that "*all* forms of learning and change start with some form of dissatisfaction or frustration", then the truly effective change agent will employ tactics that will create a feeling of emotional safety. This is done at two levels – diagnosis and intervention.

One could argue that part of the change process that took place in this case study school was enhanced by the effect on the teachers' attitude to the initiative by completing the questionnaires, mind maps and interviews; by doing these, the teachers were forced to communicate their fears and celebrations and, by doing so may have also helped them understand them.

The bespoke method of intervention would depend upon the level of diagnosis and must also take into account how the teachers perceive the agent himself and what he is trying to do. The change strategy has to be based on what the teachers sees as the impact on their teaching caused by the agent's interventions. To do this effectively, the change agent has to be part of the project – he can't be seen as someone 'out there' dictating what should be done, but in the classroom/school involved in the initiative project.

While change occurs one person at a time, there are processes and tools that can be used to facilitate this change. Tools like communication and training are often the only activities when no structured approach is applied. When there is an organizational change management perspective, a process emerges for how to scale change management activities and how to use the complete set of tools available for diffusion managers.

7.3 Implications for CPD Practice

Because of the increasing prevalence of technology in everyday life, it is no longer appropriate to talk about "ICT training" as intermittent sessions given out whenever a local area adviser deems that it may be good to show that some training has been organised. Teachers need on-going exposure to the constantly changing usage of ICT in education. Continued Professional Development (CPD) should no longer be considered optional for schools to organise, it should be seen as an imperative.

Hunt (1971), recognises two types of staff development – what is often called CPD (In Service Education and Training) which focuses on changing a skill or applying a specific strategy, presenting a “package of skills and strategies to be learned and practiced by the teacher (and which are) often promoted as being ‘teacher-proof’- in other words, individual teachers cannot ‘mess things up’”. The implication is that the strategies will work in just about any classroom” (McKenzie, 1991). This concept, highlighted through the NOF (NGfL, 2000) training was the approach used in this case study’s teachers’ initial training where the teachers were expected to work through a series of tasks designed to familiarise them with ICT – “the customer was fitted to the basic training model.... rather than fitting the model to the customer’s needs” (Davis *et al*, 2008). The resulting antagonism towards the approach was only alleviated by the promise of a laptop at the end, even though the ‘package’ bore no relations to ‘how’ the technology could be used or what the long term implications to the teachers’ work in the classroom was going to be – and this was, after all, going to be one of the single, most important (and costly) shifts in approach in education that the British Government had introduced since the introduction of the National Curriculum in 1988. That having been said, the end result of having a laptop available for use in their own time proved a positive influence in the teachers’ attitude to using ICT: “A very high proportion of teachers (98%) made effective use of

their [laptop] computers' teachers confidence and competence changed radically for the better and most felt that their knowledge of ICT had increased 'substantially'" (Harrison, *et al* 1998, P4).

The second approach has been highlighted by the responses by this study's teachers and would build on an appropriate match between the teachers' levels of development and experiences taking into account what McKenzie (1971) calls the 'special demands of Room 236' – the individual teacher. This approach aims to move the teachers towards a new paradigm – a new way of teaching that involves the recognition that "teachers are adult learners with individual learning styles, different stages of development and quite divergent interests and needs" (Bents and Howey, 1981, p18). Taking into account the emotional level of each teacher has been shown by other research to be a major contributor to effective CPD (Bradley and Russell, 1997; Rosen and Weil, 1995). Such CPD is not just for the pedagogy, there also has to be some level of appreciation of how to deal with hardware problems. The teachers in the case study cited the lack of their own expertise in this area and, although there was weekly visit from a technician to deal with larger issues, when the hardware malfunctions in the classroom, some level of knowledge is required to ensure that the abandoning of the lesson was due to a technical problem and wasn't just down not knowing how to change a printer cartridge.

The most effective in-service CPD programmes should be school-based, rigorous, sustained, and designed and directed by teachers to match their own specific levels of expertise (see also BECTA, 2008). Equally important, they should balance individual priorities with school and local education authority needs - the responses in this case study clearly show this. The teachers, despite, being held back by lack of technical expertise, are willing to work at effectively integrating ICT into their

students' learning and there is generally a high level of commitment to this innovation. Similarly to the research findings of Williams *et al* (2000), the comments from the case study teachers for any form of training shows that it will be most successful if the training matches their own level of development and that there is an appropriate level of technical training as well. Although Rogers' (2003) idea that the teachers are at different stages of innovation change is viable, Ertmer and her colleagues (Ertmer *et al*, 1999) take this one stage further and say that the teacher is also likely to be at more than one level at the same time - making the argument for individually designed CPD all the more important. The use of a localised support team, as envisaged by many LEAs, although not as effective as an 'on demand, in school' resource, does go at least some way to supporting the teachers in schools too small to support their own ICT technician.

However, CPD is not just about the 'how to' aspect - CPD needs to take into account pleas raised by such as Kenway that teachers need to be not only skilled but "informed and critical" users of the technology (Kenway, 1995, p 57). "Computers in schools are physical artefacts which governments can deliver, can point to as a symbol of action and commitment. The computer is an icon to demonstrate to parents that ICT is a force in education" (Lloyd, 2003, p2). But it is not the computer itself that is the change agent; rather, it is the teacher being self-reflective about his or her own practices. ICT CPD programmes, ideally, will be designed with Kenway's plea in mind while also addressing the issues noted in the present case study; that is, the need to change attitudes and provide basic competencies while keeping in mind the different perceptions, abilities and experiences of the teachers.

7.4 Planning For ICT CPD

ICT is rapidly altering the paradigm of schooling, whether for better or worse is discussed elsewhere (Selwyn, 1999; Watson, 1997; BECTA 2005, BECTA 2008, Kankaanranta, 2001). The vision for schools of the future extends from those held by such ‘historical’ figures as Ivan Illich (1973) through the home-learning society envisaged by Graham Hewitt quoted in Davies and West-Burnham (2003) and those no less imaginative and now no less plausible of having children working in schools with their own laptops, linking to the teacher and other resources via the computer (Dettman, 1997) to current visionaries such as Bill Gates:

“Students can look at their grades and even turn in their homework over the Web. Teachers hold on-line discussion groups. Students email friends and family as naturally as they call them. Students are the ultimate knowledge workers. Their ‘job’ is to learn and explore and find unexpected relationships between things” (quoted in MacGilchrist *et al* 2004).

Although Gates’ commentary was considered a futuristic view, many teachers are now at this point but still very much in control (including setting homework!) since they ‘hold’ the on-line discussions rather than facilitate or participate. In agreement with Vygotsky (1978), Rutter *et al* (1979) and others, there is a belief that teachers do make a difference and “are more important than even the most sophisticated educational tool” (Mellon 1999, p34).

Though there is evidence of significant integration of technology across the curriculum, the range of uses remains fairly limited and practitioners rarely realise the full benefits of technology in

supporting learners. Use of digital resources and tools is regarded as optional in many cases, suggesting a need to ensure professional standards and requirements, and cultures of practice, are in place which recognise the technology as a core tool in a modern education and skills system ('Harnessing technology', BECTA 2008, p23).

That being the case, we need to consider how best we can develop teachers professionally to ensure that they can, at the least hold the discussion as envisaged by Gates, and, at best, facilitate one.

Definitions of what professional development is depend very much on what such development activity is set to achieve. One of the underlying assumptions of teacher development is lifelong learning. If the goals are to be set to keep the teacher continually up to date with current ICT then the professional development needs to be on-going, pro-active, bespoke (Granger, 2002) and, as Mintzberg and McHugh (1985) states, balanced between boldness of vision and realistic understanding of what will be involved in terms of time and resources.

7.5 Strategic ICT CPD

In all the strategic management and organisation theory, the concept of uncertainty is integral to the planning. In a risky and changeable environment such as ICT, development training should be flexible and schools need to be alert to adapt training and resources to external changes. In the past, according to Mintzberg and McHugh's (1985) terminology, the school was an 'operating adhocracy' where such training reflected the *raison d'être* of schools - to work on behalf of a governing body which fought shy of decisions committing resources or setting patterns for the long term, mainly

because they were continuously responding to a changing environment which they could not predict. However, with the concept of school improvement very much in mind, schools are now becoming more comfortable with the notion of ICT CPD strategic intent which follows broadly agreed tracks but which flex and respond according to emerging trends (Hall and Loucks, 1978).

Strategic ICT CPD intent can have pitfalls. This approach to ICT management requires an explicit sense of direction and purpose. The Headteacher needs vision and the ability to put that vision into action, applying what Dalin and Rust (1996, p 59) call *Critical Mass* to ensure that all the stakeholders pull together for constructive development.

In the need to avoid 'short-termism' (Davies and Ellison, 1999, p75), we start looking to the future nature of schooling and its implementation. This concept of visioning is a key point of concern (witness the emphasis placed on it by the Teacher Training Agency's associated National Professional Qualification for Headship work); indeed, Deal and Peterson (1990) focus on this point when offering some guidance for development (adapted for ICT implementation):

- The vision of a school leader includes a mental image of a possible and desirable future state of ICT in the school given the resources and the level of expertise of the staff.
- The vision will embody the leader's own view of what constitutes excellence in the use of ICT.
- The vision of a school leader also includes a mental image of a possible and desirable future state of ICT for the broader educational scene and for society in general.

- The vision of a school leader also includes a mental image of a possible and desirable process of change through which the preferred future state of ICT integration will be achieved.
- Each aspect of the ICT vision for the school will reflect different assumptions, values and beliefs about such matters as the nature of humankind; the purpose of schooling; the roles of government, family and church in schooling; approaches to teaching and learning; and approaches to the management of change.

Keeping in mind these points and the numerous *caveats* by Foreman (1998) that visioning is not to be ‘top down’, it is a key aspect that all the stakeholders should feel enthused about the leader’s vision and not be resentful and unwilling participants. This future thinking needs to have some starting points. Davies and Ellison (1999) cite some examples of trends which could have an impact on development in schools in general, and ICT in particular, in the future:

- Radical changes in the nature of learning and teaching – the core process of school. This is particularly important with learning, as the new technologies will exert a powerful influence, giving students 24-hour access to high quality learning resources and thus altering the traditional role of the school and teachers. This is particularly well highlighted in the work on ‘Intelligent Schools’ by MacGilchrist *et al* (2004) who offers a framework for school leaders to think about different ways to consider the learning and teaching that takes place in their schools – “[to] synthesize different kinds of knowledge, experience and ideas in order to be confident about current achievements and to have the ability to decide what to do next” (p xv).

- An increasing emphasis on life-long learning and the school as part of the community (Davies and Ellison, 1999, pp11-22). More recently the Leitch Report (Leitch, 2006) was tasked by the government to quantify the current skills set of the UK population and propose areas for enhancement in numeracy, literacy and ICT skills.

7.6 Putting the Basics in Place

The plan for staff development needs to be geared towards ‘informed users’. The case study school had gone a long way to implementing the structures and the hardware but had not allowed for sufficient time and effort in bringing the staff on board. From this research, effective training requires:

- a focus on the hardware and software that the teachers need to use (including email and internet)
- that the training be conducted at the teacher’s base using the user- interface with which the teachers are familiar.
- interaction; with the teachers being given the opportunities to experiment with a mentor close by.
- suitable training for dealing with minor technical problems and
- access to a local technician for those areas beyond the teachers’ ability
- continual update of on-line resources.

These experiential conclusions have also been confirmed by research covered by Borko and Putnam (1995) who stated: “Teachers themselves must make the desired changes. To do so they must acquire richer knowledge of subject matter, pedagogy and subject-specific pedagogy.

Successful professional development efforts are those that help teachers to acquire or develop new ways of learning, learners and subject matter, thus constructing a professional knowledge base that will enable them to teach students in more powerful and meaningful ways”, which, after all, is what we are really here to do. Thus, when we create an environment that can facilitate and support this teacher learning, in a way that fits in with the overall vision for the school, we can help the teachers to adapt to teaching in some fundamentally different ways. The teacher’s role will be moving towards one of “process facilitator and interventionist rather than content expert” (Day, 1999, p207); as the child will be learning as much at home or on the internet as through school, so the teacher will be taking on more of the role of human contact to ensure the continuance of the lifelong learning process; finally the teacher will become a “learning counsellor” (Day, 1999, p207), referring the subject content and opening up a wider partnership between the school, the child and the parents.

West-Burnham (1994, p84) helps us to define the extended time-frame in which to “translate vision and values into significant, measurable and practical outcomes” as three to five years. During this time, we are also considering evaluation, changes in direction and adaptation to new ICT initiatives and technological developments. Flexible planning is the order of the day, “simplicity usually works better than complexity (and) moderate expertise proves as effective as great expertise” (Pant and Starbuck, 1990, p433).

The first three years of ICT CPD planning should be relatively easy to predict as most government initiatives for ICT are based on similar timescales. The way forward, according to Abbott (2001) “is more likely to be through small, but important steps than by wholesale dramatic changes” (p121). Technical innovation, as already mentioned can be imagined within a similar time frame predicted by ‘judgment rather than techniques’ (Dimma, 1985, p25) such as extrapolations or computer-generated models. The intent can never be effective by itself - it is the presence of the continual review that makes it sustainable.

7.7 The Next Step? Planning And Sustaining Future ICT CPD

I have discussed the concerns about future planning and the problems such open-ended planning has where knowledge about any future initiatives may be limited. Allaire and Firsitoru (1989, p7) noted “uncertainty is the Achilles’ heel of strategic planning. Strategic planning is heavily slanted toward the ‘predict and prepare’ mode of coping with the future. The strategic plan is a ‘road map’ with a fixed and well-defined target, as well as the steps to reach that target”. Wallace (1991) chronicles a series of events in his primary and secondary case-study schools that made similar plans obsolete, including the inability to predict some shifts in central government and LEA policies and the possibility, if not the timing, of others.

Given all that has been written about what can go wrong with any strategic ICT CPD intent, can it be considered a viable concept in schools? Strategic planning was originally conceived for commercial businesses that were able to have a large measure of control over their future. Outside influences impinged on this intent, but not in a major way (Mintzberg, 1994). The many early theorists (Ansoff,

1965, Drucker, 1955, Malmow, 1972, Steiner, 1979) developed analytical tools to identify and evaluate strategies, but there was little, if any actual planning taking place. The companies were able to enhance their development plans almost in a cocooned environment.

When American industry started being faced with serious overseas competition, they started acting, according to Mintzberg (1994, p208) “Much like Chicken Little being hit on the head by an acorn, its planners ran around crying ‘The environment’s turbulent! The environment’s turbulent!’” Since then, the visionary approach is often cited as the more flexible way to deal with an uncertain world. With this move, many (Weinstein, 1995; Hambden-Turner, 1995) would argue ‘yes’, we can use such planning in ICT CPD planning as it sets the broad outline while leaving the specific details to be worked out later. In other words, “the broad perspective may be deliberate, but the specific positions can emerge. So when the unexpected happens, assuming the vision is sufficiently robust, the organisation can adapt – it learns. Certain change is thus easily accommodated” (Mintzberg, 1994, p210).

Despite these *caveats* the key phrase from Wallace is “predict the possibility, if not the timing of others”. Given the cost involvement of leading edge technology, most schools would consider themselves to be in the enviable situation of being at least one pace behind that edge. As such, then, schools could at least predict what current developments would be economically accessible within the time frame of the strategic intent and plan their ICT CPD accordingly.

As far as current state primary schools are concerned, we have already seen the effect on ICT provision through the National Grid for Learning initiative (Selwyn, 1999) and the increased monies

through the Lottery's New Opportunity Funding and the 'Laptop for Teachers' initiative. With a number of LEAs moving all their county-school communications through broadband computer links and the subsequent benefits to the children with access through such high-speed systems, we already have one strand of the strategic intent which can act as a guide for future staff development.

We can already see that the nature of schooling is changing:

- In 1993, Drucker wrote: 'What will be taught and learned; how it will be taught and learned; who will make use of schooling; and the position of the school in society – all of this will change greatly during the ensuing decades. Indeed, no other institution faces challenges as radical as those that will transform school' (p209). Today, according to Dickinson (2000), much of this has happened or is happening: "we have all the knowledge and tools we need to create an effective system that can help meet the needs of today's and tomorrow's students. We have already seen many new interactive technologies along with a renaissance of the arts in education, hands-on projects, inquiry-based learning, cooperative learning, internships, and community service projects that deeply engage students and result in academic achievement".
- From a nineteenth century factory model to a twenty-first century one of emphasis on children's learning, gearing the profession towards what the children learn rather than what the teacher teaches (eg through the numeracy and literacy strategies) – a focus on learning rather than teaching and where the students are considered the 'clients'. In the case of ICT, it is likely to be based less around the transmission of knowledge, but rather around learning from others using 'Knowledge Navigators' (Scully, 1987).

- Headteacher management models are moving more and more to collegiality and leadership rather than ‘management’.
- The recognition that learning should be life-long.
- The need for be more proactive – creating cultures based on responsiveness where monitoring and evaluation are key features.
- A move towards more global awareness through the use of internet-based inter-school projects.
- A shift in focus and choice to the learner as new technologies are developed.
- Schools becoming more independent in their management of funding, staffing and physical resources.

Many of the technology tools used in education and skills were designed to serve the needs of business. Although many of these are useful for education, we also need specific and customised planning, curriculum management, and teaching tools for teachers and trainers to use as a natural part of their professional repertoire. (BECTA 2008) With these and similar ‘expectations’ (Davies and Ellison, 1999, pp246-256) in mind, the benefits gained from engaging in strategic ICT CPD planning are many. Returning to the initial focus, the school would be using the teachers’ previous experience to plan for the school’s needs in an uncertain future by looking to adopt a process along the lines shown in Figure 7.2.

The start of the process is linear to the review section, but then moves into a continual cyclical process along the lines of Hargreaves and Hopkins (1990) and Fidler and Bowles (1991). The review section allows for what Davies and West-Burnham (1997, p 65) term ‘re-engineering’ which can be different for various points of the strategic ICT CPD journey.

The point at which this re-engineering occurs, according to Handy (1990) is decided by the reflective Headteacher, who has to ensure that the school does not rest on its laurels, and takes the risk of moving into a new direction before the change develops into a downward or stagnant one.

So, in any planning for strategic intent, we need to be able to answer three questions: (1) what priorities do we need to change? (2) what should we change next? (3) what should we change it to:

Vision :

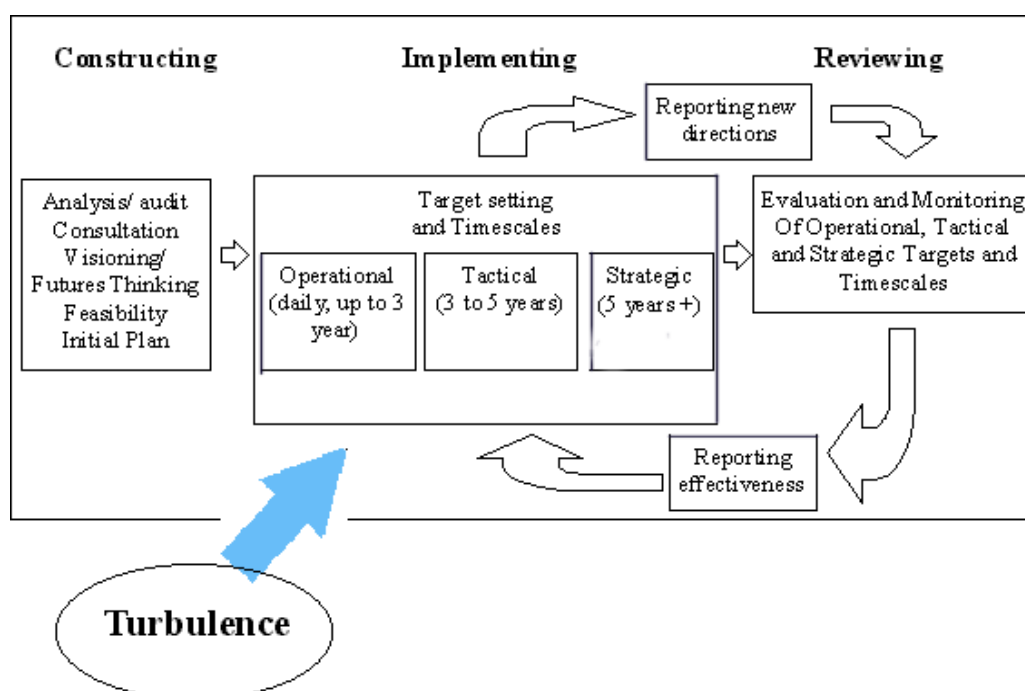


Figure 7.2 Planning and review

A school which has ICT capability effectively integrated into all aspects of the curriculum and a staff trained for this use.

Resource implications – physical:

- Additional computers
- Extension of network and internet cabling
- additional licenses for software
- Fast internet connection using broadband technology
- Connection of class computers with suitable password firewalls enabling teachers to access central record and tracking data.
- Phased expenditure.
- Maintenance costs – especially in light of changes in funding.

Resource implications – human:

- Audit of teachers' ICT capability. Implementation of any necessary remedial training to ensure basic level of skills attained.
- We know that there will be some CPD required for as yet unknown areas but there will certainly be CPD for teachers to cover: use of the network, internet, email and the network (especially with a view to accessing centralised record and tracking data). An approach to staff CPD can be clearly seen in the 'Red Folder' of DfES approved providers of teacher training for integration of ICT into the curriculum (NGfL, 2000).
- Training in critical appraisal of software suitability.
- Consideration for changes in the role of the teacher with more reliance upon technology.
- Introduction of 'computer mentors'. These would be children who, in Year 4, would follow a course that would enable them to operate the network, scanner, digital camera and other peripherals as well as solve basic problems. By starting in Year 4, the programme would enable these children to develop each year and would give maximum return for time spent in training. Sessions need to be set aside for such training, probably as an after-school club.
- Performance management and its impact on target setting for the teachers – particularly in the case of ICT.
- Emphasis on life-long learning not just for professional use, but also for personal advancement.

Other

- Move to establishment of a local consortium for pooled resources such as CPD, programmes, technical support or bulk purchase of expendable resources.

- Expansion of school.
- New housing developments.

Turbulence – consider:

- Keep up to date with curriculum reviews and judge what impact any new initiatives will have on the intent. Use of internet-based chat rooms such as ‘TalkingHeads’
- Unexpected fall in numbers.
- Change in government with associated changes in educational direction.
- Future of web-conferencing and distance learning.
- Radical changes in cost and availability of technology.
- Possibility of the creation of a more flexible workforce.
- Unresolved and, as yet, unknown, influences.

Timescale:

- Linking together such aspects as immediate need for basic training with a long-term view as to how the school will introduce new technology.
- What can be realistically be achieved given likely resources and staffing levels. Linked to this would be long-term fundraising by the PTA.

Such concepts outlined above would be the basis for the next stage - discussion and collaboration amongst the stakeholders. It is not enough for the Headteacher to have a vision and to be able to ‘sell’ it. No one person can endeavour to recognise all necessities, but the collegial approach engages all concerned in the debate about the influences on the pupils’ learning and ensures inclusion of other viewpoints and ideas and, most importantly, ownership of the intent.

Despite the problems associated with planning for an uncertain future, the use of such a perspective is an essential tool in the arsenal of the Headteacher of the twenty-first century. Change is never easy and strategic planning has pitfalls (and can require the stamina of a ‘superman’ to see it through!) but it shows a degree of being proactive and, as Wallace (1991) has argued so well, in today’s

continually changing educational climate that has got to give the school an advantage. There is no 'success' or 'failure', the experiences gained are simply converted to positive learning and used to move on and develop. The alternative is to be reactive at best and stagnant at worse.

7.8 Importance of this Research and the Possible Contribution to the Field.

The thesis started out with four proposed research questions

- What part does teacher confidence play in the integration of ICT into the classroom?
- What has an impact on this confidence?
- What implications does this have for continued professional development (CPD)?
- Can we model the case study into a proposal to help other teachers?

The data from this research partly supports the role of teacher confidence in the way ICT is implemented. There were a number of areas that can impact that confidence, but it was hardware reliability and the availability of technical expertise that featured most prominently in the comments from all three case studies as causes for frustration. Given the time line between the start and end of this project it would be a question that could be re-examined.

In considering how to ensure that such diffusion initiatives are more successful, then we need to look very closely at how CPD is delivered. Because of the technical knowledge required in this innovation the approach cannot mirror that of the Literacy or Numeracy initiatives where a methodology was the key to implementation. It is clear from the comments made by the case study subjects that there

was a need for bespoke training and that such training may also needed to be at an individual level to cater for the extreme spectrum of technical expertise.

Certainly there is room to consider how such an individualised approach could better serve CPD provision – perhaps there is also scope for more controlled research into the effectiveness of such an approach with cohorts who, even in the past ten years, have become more ‘tech savvy’ ?

The research evidence formed from this study has addressed the questions and could help to inform ICT CPD facilitators on how to increase the likelihood that teachers will return to their classrooms and make effective use of ICT resources across the primary school curriculum. With a move into the 21st century, it is hoped that finally we will have effective CPD that is meaningful, effective, takes a bespoke approach taking into account the emotions and backgrounds of the teachers individually and helps the teachers do what they do best – help the children to learn in an exciting, relevant and technological way.

- ABBOTT, A. & FARIS, S. (2000). Integrating technology into pre-service literacy instruction: a survey of elementary education students' attitudes towards computers. Journal of Research on Computing IN Education, 332, 149-161.
- ABBOTT, C. (2001). ICT: Changing Education, London: Routledge Falmer.
- AKBABA, S. & KURUBACAK, G. (1998). Computers IN Social Studies Journal, 7(4).
Available: <http://wrvw.coe.uh.edu/insite/elec-pub/FIIML1998/re-akba-htni>
- ALLAIRE, Y. and M. E. FIRSITORU, (1989). Coping with Strategic Uncertainty, Sloan Management Review, 30, 3 (Spring), 7-16.
- ANDERSON, T. & HUANG, S. (1989). On using concept maps to assess the comprehension effects of reading expository text. Centre for the Study of Reading. Cambridge: MA.
- ANDREWS, P. (1997). Secondary teachers' perceptions of computer availability: a qualification study Technology, Pedagogy and Education, 6, 321-335.
- ASHFORTH, B. E. & HUMPHREY, R. H. (1995). Emotion in the workplace: A reappraisal. Human Relations, 482, 97-125.
- ANSOFF, H.I. (1965). Corporate strategy: an analytic approach to business policy for growth and expansion. New York: McGraw-Hill
- ATKINSON, P. & DELAMONT, S. (1985). Bread and Dreams or Bread and Circuses? A critique of Case Studies IN SHIPMAN, M. (Ed) Educational Research: Principles, Policies and Practices. London: Farmer.
- AUSUBEL, D. (1968). Educational Psychology: a cognitive view. New York: Holt, Rinehart and Wilson.
- BABBIE, E. (1992). The practice of social research. Belmont, CA: Wadsworth.
- BALANSKAT, A., BLAMIRE, R. & KEFALA, S. (2006). The ICT Impact Report: A review of studies of ICT impact on schools in Europe. Available:
http://insight.eun.org/shared/data/pdf/impact_study.pdf
- BANDURA, A. (1977). Social Learning Theory. Englewood Cliffs: NJ: Prentice Hall.
- BARENHOLZ, H. & TAMIR, P. (1992). A comprehensive use of concept mapping in design instruction and assessment. Research in Science and Technological Education, 10, 1, 37-52.
- BARON, G., BRUILLARD, E. & CHAPTAL, A. (Eds) (1997). From personal use to classroom use-implications for teacher education in France. London: Chapman & Hall.
- BARONE, D. (Ed) (2004). Case Study Research: Literacy Research Methodologies. London: The Guilford Press.

- BARTLETT, A. (2002). Preparing preservice teachers to implement performance assessment and technology through electronic portfolios. Action in Teacher Education, 24,1, 90-97.
- BARTON, R. & HAYDN, T. (2004). Trainee teachers and their impact on learning. A study of trainees views on what helps them to use ICT effectively in their subject teaching. BERA Annual Conference. University of Manchester. 16-18 September. Available: <http://www.leeds.ac.uk/educol/documents/00003808.htm>
- BASSEY, M. (2004).. Case Study Research IN Swann, Joanna and Pratt, John (Eds), Educational Research in Practice: making sense of methodology. London: Continuum International Publishing Group.
- BEASTALL, L. (2006). Enchanting a disenchanted child: revolutionising the means of education using Information Technology and e-learning. British Journal of Sociology of Education, 27, 97-110.
- BEATTY, B. (2000). The emotions of educational leadership: Breaking the Silence. International Journal of Leadership in Education, 3, 4, 331-357
- BECKER, H. J. (1998). Running to catch a moving train: Schools and information technologies. Theory into Practice, 37, 20-30.
- BECKER, H. J. (2000). How exemplary computer-using teachers differ from other teachers: Implications for realizing the potential of computers in schools. Contemporary Issues in Technology and Teacher Education, 1, 274-293.
- BECKER, H. J. & RIEL, M. (2000). Teacher professional engagement and constructivist-compatible computer use, Irvine: Centre for Research on Information Technology and Organisation, University of California.
- BECTA (2001). NGfL Pathfinders. Coventry: BECTA.
- BECTA (2004). A review of the Research Literature on barriers to the uptake of ICT by teachers. Coventry: BECTA.
- BECTA (2005). The BECTA Review2005. Coventry: BECTA.
- BECTA (2006). The BECTA Review 2006. Coventry: BECTA.
- BECTA (2007). What the research says about ICT and Continuing Professional Development. Coventry: BECTA.
- BECTA (2008). Harnessing Technology: Next generation learning 2008- 2014. Coventry: BECTA.
- BEEBE, S. & MASTERSON, J. (2008). Communications in small groups: principles and practice., London: Allyn and Bacon.

- BELL, D. (1976). The Coming of Post-industrial Society: A Venture in Social Forecasting. New York: Basic Books.
- BENBASAT, I., GOLDSTEIN, D. & MEAD, M. (1987). The Case Research Strategy in Studies of Information Systems. MIS Quarterly, September, 369-386.
- BENTS, R., & HOWEY, K. (1981). Staff Development- change in the individual. Alexandria, Virginia: ASCD.
- BEOKU-BETTS, J. (1994). When black is not enough: Doing field research among Gullah Women. National Women's Studies Association Journal. 6(Fall), 413-33.
- BEYERBACH, B., WALSH, C. & VANNATTA, R. A. (2001). From teaching technology to using technology to enhance student learning: Preservice teachers changing perceptions of technology infusion. Journal of Technology and Teacher Education, 9, 1, 105-127.
- BIKOS, K. (1995). Teachers and IT. The attitudes of English teachers towards the introduction of IT in general education Thessaloniki: Afi Kiriakidi.
- BLACKMORE, M., STANLEY, N., COLES, D., HODGKINSON, K., TAYLOR, C. & VAUGHAN, G. (1992). A preliminary view of students information technology experience across UK initial teacher training institutions. Technology, Pedagogy and Education. 1, 2, 241 - 254.
- BOLTON, G. (2001). Reflective Practice: Writing and Professional Development. London: Paul Chapman.
- BORG, W. (1981). Applying Educational Research: A Practical Guide for Teacher. New York: Longman.
- BORKO, H. & PUTNAM, R. T. (1995). Expanding a teacher's knowledge base: A cognitive psychological perspective on professional development IN Guskey, T. R., & Huberman, M, Professional Development in Education: New paradigms and Practices. New York: Teachers College Columbia University.
- BOSCH, K. & CARDINALE, L. (1993). Preservice Teachers' Perceptions of Computer Use during a Field Experience. Journal of Computing in Teacher Education, 10.1, 23-27.
- BRADBURN, N., SUDMAN, S. & ASSOCIATES (1979). Improving interview method and questionnaire design. San Francisco: Jossey-Bass.
- BRADLEY, G. & RUSSELL, G. (1997). Computer experience, school support and computer anxieties. Educational Psychology, 117, 267-284.
- BROWN, S. & EISENHARDT, K. (1998). Competing on the Edge. Boston: Harvard Business School Press

- BRUSH, T., GLAZEWSKI, K., RUTOWSKI, K., BERG, K., STROMFORS, C. & VAN-NEST, M. (2003). Integrating technology in a field-based teacher training program: The PT3@ASU project. Educational Technology, Research and Development, 51, 1, 57-73.
- BULLOCK, D. (2004). Moving from theory to practice: An examination of the factors that preservice teachers encounter as the attempt to gain experience teaching with technology during field placement experiences. Journal of Technology and Teacher Education, 12, 211-237.
- BULMER, M. (1982). The merits and demerits of covert participant observation IN Bulmer, M., Social Research Ethics. London: Macmillan.
- BURKHARD, R. & MEIER, M. (2004). Tube map: Evaluation of a visual metaphor for interfunctional communication of complex projects. I-KNOW 04 Conference. Graz: Austria.
- BUZAN, T. & BUZAN, B. (2003). The Mind Map Book. London: Butler and Tanner.
- CAMPBELL, D. (1975). Degrees of freedom and case study. Comparative Political Studies, 8, 178-193.
- CAÑAS, A. et al (2003). A Summary of Literature Pertaining to the Use of Concept Mapping Techniques and Technologies for Education and Performance Support. Pensacola, FL: The Institute for Human and Machine Cognition. Available:
<http://www.ihmc.us/users/acanas/Publications/ConceptMapLitReview/IHMC%20Literature%20Review%20on%20Concept%20Mapping.pdf>
- CAPLAN, G. (1964). Principles of Preventive Psychiatry. New York: Basic Books.
- CARLSON, T. (2001). Using metaphors to enhance reflectiveness among preservice teachers. Journal of Physical Education, Recreation & Dance, 72, 1, 49-53.
- CARPENTER, P. A. & SHAH, P. (1998). A model of the perceptual and conceptual processes in graph comprehension. Journal of Experimental Psychology: Applied, 4, 2, 75-100.
- CARSWELL, C. M. & RAMZY, C. (1997). Graphing small data sets: Should we bother? Behaviour and Information Technology, 16, 2, 61-71.
- CASTELLS, M. (1996). The Rise of the Network Society. The Information Age. Malden, Mass: Blackwell.
- CHARALAMBOUS, K. & KARAGIORGI, Y. (2002). Information and communication technology inservice training for teachers: Cyprus in perspective. Technology, Pedagogy and Education, 112, 197-215.
- CHEN, A. Y. & LOOI, C. K. (1999). Teaching, learning and inquiry strategies using computer technology. Journal of Computer Assisted Learning, 152, 162-172.

- CHEN, D. (2003). A classification system for metaphors about teaching. Journal of Physical Education, Recreation & Dance, 74, 2, 24-31.
- CHRISTENSEN, R. (2002). Effects of Technology Integration Education on the Attitudes of Teachers and Students. Journal of Research on Technology in Education 34, 4, 411-433.
- CHRISTENSEN, D. and DAHL, C. (1997). 'Rethinking Research Dichotomies', Family and Consumer Sciences Research Journal 25 (March): 269-85.
- CHRISTENSEN, R. & KNEZEK, G. (1998). Parallel Forms for Measuring Teachers' Attitudes Toward Computers. SITE 98.2, 831-83. Charlottesville, VA: Association for the Advancement of Computing in Education.
- CICOUREL, A. & JENINGS. (1974). Language Use and School Performance. New York: Academic Press.
- CLARK, G. (1998). Stylized Facts and Close Dialogue: Methodology in Economic Geography. Annals of the Association of American Geographers, 88, 73-87.
- CLARK, K. D. (2000). Urban Middle School Teachers' Use of Instructional Technology. Journal of Research on computing in Education, 33, 2, 178- 191.
- CLARKE, V.A. & CHAMBERS, S.M. (1989). Gender-based factors in computing enrollments and achievement: Evidence from a study of tertiary students. Journal of Educational Computing Research, 5, 4, 409-429.
- CLEMENT, J., ZIETSMAN, A. and BROWN, D. E. (1989). 'Not all preconceptions are misconceptions: finding "anchoring conceptions" for grounding instruction on students' intuitions', International Journal of Science Education, 11, 5, 554-65.
- COLE, M. & ENGESTRÖM, Y. (Eds) (1993). A cultural-historical approach to distributed cognition. Cambridge: Cambridge University Press.
- CONCEPTDRAW (2007). Mindmap (software).
Available: <http://www.conceptdraw.com/en/products/mindmap/main.php>
- CONDIE, R., MUNRO, B., MUIR, D. & COLLINS, R. (2005). The Impact of ICT Initiatives in Scottish Schools: Phase 3. Edinburgh: Scottish Executive Education Department. Available: <http://www.scotland.gov.uk/Publications/2005/09/14111116/11170>
- CONDIE, R., MUNRO, B., SEAGRAVES, L. & KENESSON, S. (2007). The Impact of ICT in schools - a landscape review. Coventry: BECTA. Available: www.becta.org.uk/publications
- CONLON, T. (2004). A Failure of Delivery: the United Kingdom's New Opportunities Fund programme of teacher training in information and communications technology. Journal of Inservice Education, 30, 1, 115-139.

- COOPER, A. (1997). The Myth of Metaphor.
Available: http://www.cooper.com/articles/art_myth_of_metaphor.htm
- COPPS, A. (1999). Now it's teachers who need to learn. The Times (London) - Interface, 8 September.
- COX, M., PRESTON, C. & COX, K. (1999a). What factors support or prevent teachers from using ICT in their classrooms? British Educational Research Association Annual Conference. University of Sussex at Brighton.
- COX, M., PRESTON, C. & COX, K. (1999b). What motivates teachers to use ICT? British Educational Research Association Annual Conference. University of Sussex at Brighton.
- C-TOOLS (software) (2003). Michigan State University. Available:
<http://ctools.msu.edu/ctools/index.html>
- CRADLER, J. & CRADLER, R. (1995). Prior studies for technology insertion, San Francisco, CA: Far West Laboratory.
- CRAGEN, J., WRIGHT, D. & KASCH, C. (2008). Communications in small groups: theory, processes and skill. London: Wadsworth.
- CRESSWELL, J. (1994). Research Design: Quantitative and Qualitative Approach., Beverly Hills, CA: SAGE Publications, Inc.
- CUBAN, L. (1993). Computers Meet Classrooms; classrooms win. Teachers College Record 95, 185-210.
- CUBAN, L. (1999). The technology puzzle. Education Week, 8, 43. Available:
<http://www.edweek.org/ew/vol-18/43cuban.h18>
- CUBAN, L. (2001). Oversold and underused: Computers in the classroom, Cambridge, MA: Harvard University Press.
- CUCKLE, P., CLARKE, S. & JENKINS, I. (2000). Students' information and communication skills and their use during teacher training. Technology, Pedagogy and Education, 91, 9-22
- CUNNINGHAM, G. (2005). Mindmapping: Its Effects on Student Achievement in High School Biology. Available:
<http://www.lib.utexas.edu/etd/d/2005/cunninghamg36414/cunninghamg36414.pdf>
- DALIN, P. & RUST, V. (1996). Towards schooling for the twenty-first century. London: Cassel.
- DAMASIO, A. (1994). Descartes Error. London: Papermac.
- DAVIDSON, J. (1970). Outdoor recreation surveys: The design and the use of questionnaires for site surveys. London: Countryside Commission.

- DAVIES, B. and ELLISON, L. (1999). Strategic Direction and development of the school. London: Routledge.
- DAVIES, B. AND WEST-BURNHAM, J (1997). Reengineering and Total Quality in Schools: How to Reform and Restructure your School to meet the Future. London: Financial Times/Pitman Publishing.
- DAVIES, B. & WEST-BURNHAM, J. (2003). (Eds) Handbook of educational leadership and management. London: Pearson Education.
- DAVIS, N., PRESTON, C. & SAHIN, I. (2008). Training teachers to use new technologies impacts multiple ecologies: Evidence from a national initiative. British Journal of Educational Technology, 40, 1, 135-148.
- DAVIS, N. & THOMPSON, E. (2005). The evaluation of technology-related professional development, symposium and paper IN CRAWFORD, C., CARLSEN, R., GIBSON, I., MCFERRIN, PRICE, J. & WEBER, R. (Eds) Society for Information Technology and Teacher Education international conference annual. Charlottesville, VA.: Association for the advancement of Computing in Education.
- DAWES, L. (1999). First connections: Teachers and the national grid for learning. Computers and Education, 33, 235-252.
- DAY, C. (1993). Reflection: a necessary but not sufficient condition for professional development. British Educational Research Journal, 19, 1, 83-93.
- DAY, C. (1999). Developing Teachers: The Challenges of Lifelong Learning. London: Falmer Press.
- DAY, C. (pre-publication copy). The Role of Emotions in Stories of Narrative and Change. University of Nottingham.
- DAY, C. & LEITCH, R. (2001). Teachers and Teacher Educators Lives: The Role of Emotion. Teaching and Teacher Education, 17, 4, 403-415
- DEAL, T., & PETERSON, K. (1990)..The principal's role in shaping school culture. Washington D.C.: U.S. Government Printing Office
- DE FREITAS, M. & BYRNE, E. (2006). ACM International Conference Proceeding Series. 2006 annual research conference of the South African Institute of Computer Scientists and Information Technologists on IT research in developing countries. 204, 90-99. Somerset West, South Africa.
- deCATANZARO, D. (1999). Motivation and emotion: Evolutionary, physiological, developmental, and social perspectives. Upper Saddle River, NJ,: Prentice Hall.
- DENSCOMBE, M. (1998). The Good Research Guide. Buckingham: Open University Press.

- DENZIN, N. (1970). Sociological Methods: A Source Book. London: Butterworths.
- DENZIN, N. (1978). The Research Act. New York: McGraw-Hill.
- DETTMAN, P. (1997). The Laptop revolution IN Davies, B. & West Burnham, J. (Eds) Reengineering and Total Quality in Schools, London, Pitman Publishing.
- DEUTSCH, C. P. (1981). The behavioural scientist: Insider and Outsider. Journal of Social Issues, 37, 172-91.
- DFES (1997). Connecting the Learning Society. London: HMSO.
- DFES (1998). Survey of Information and Communication Technology in Schools. Norwich: The Stationery Office.
- DFES (1999a). Statistics of Education: Survey of Information and Communication Technology in Schools 1999. London: The Stationery Office.
- DFES (1999b). The National Literacy Strategy. , London: HMSO.
- DFES (2000a). Survey of Information and Communications Technology in Schools. London: HMSO.
- DFES (2000b). The National Numeracy Strategy. London: HMSO.
- DFES (2005). Harnessing Technology: Transforming learning and children's services. London: HMSO.
- DIMMA, W.A. (1985). Competitive Strategic Planning. Business Quarterly, 50, 1, 22-26.
- DICKINSON, D. (2000). Education 2050 IN WILLIAMSON, M (Ed) Imagine: What America Could be in the 21st Century. New York: Rodale Press.
- DOERING, A., HUGHES, J. & HUFFMAN, D. (2003). Preservice teachers: Are we thinking with technology? Journal of Research on Technology in Education, 35, 3, 342-361.
- DONNELLY, J. (Ed) (1995). IT in Schools: A Handbook for Senior Managers. Birmingham :The Questions Publishing Company.
- DOUGLAS, J. (1976). Investigative Social Research. Beverly Hills, California: SAGE Publications, Inc.
- DROSSOS, E. (1998). The current policy for the use of ICT in primary education. Implication for initial teacher education. UK: Lancaster University.
- DROSSOS, V. & KIRIDIS, A. (2000). ICT and teacher training: The international experience. Modern Education, 115, 13-20.

- DRUCKER, P. (1955). *The Practice of management*. New York: Harper and Brothers.
- DRUCKER, P. (1986). Innovation and entrepreneurship. London: Pan Books.
- DRUCKER, P. (1993). Post Capitalist Society. New York: Harper Business.
- DUNN, S. & RIDGWAY, J. (1994). What CATE did: An exploration of the effects of the CATE criteria on students' use of information technology during teaching practice. Technology, Pedagogy and Education, 31, 39-50.
- DUPAGNE, M. & KRENDL, K. A. (1992). Teachers attitudes towards computers: a review of the literature. Journal of Research on Computing in Education, 24, 420-429.
- DÜRSTELER, J. (2002). The Visual metaphor. Available:
<http://www.infovis.net/printMag.php?num=91&lang=2>
- EDWARDS, D. (1999). Motivation and Emotion, Thousand Oaks, California: SAGE Publications, Inc.
- EHMAN, L. H, BONK, C. J. and YAMAGATA-LYNCH, L. C. (2005). A model of teacher professional development to support technology integration. Association for the Advancement of Computing in Education Journal, 13, 3, 251-272.
- EIFLER, K., GREENE, T. & CARROLL, J. (2001). Walking the talk is tough: From a single technology course to infusion. The Educational Forum, 65, 4, 366-375.
- EISENHARDT, K. (1989). Building theories from case study research. Academy of Management Review, 14, 4, 532-550.
- EKMAN, P. (1992). An argument for the basic emotions. Cognition and Emotions, 6, 192-200.
- ELLIOT, J. & ADELMAN, C. (1976). Innovation at the classroom level: a case study of the Ford teaching project, Unit 28 of the curriculum design and development course. Milton Keynes: Open University Press.
- ELLSWORTH, J. (2000). Surviving Change: a survey of educational change models. ERIC. Available: <http://www.ericdigests.org/2001-2/survey.html>
- ELMORE, R. & MCLAUGHLIN, M. (1988). Steady work: Policy, practice and reform in American education. Santa Monica, CA.: Rand Corporation.
- ELY, D. (1990). Conditions that facilitate the implementation of educational technology innovations. Journal of Research on Computing in Education, 23, 2, 298-305.
- EPPLER, M. J. (2003). The Image of Insight: The Use of Visual Metaphors in the Communication of Knowledge. I-KNOW 03, July 2-4, 81-88. Graz, Austria.

- EPPLER, M. J. (2006). A comparison between concept maps, mind maps, conceptual diagrams and visual metaphors as complementary tools for knowledge construction and sharing. Information Visualisation, 5, 202-210.
- ERTMER, P., ADDISON, P., LANE, M., ROSS, E. & WOODS, D. (1999). Examining teachers beliefs about the role of technology in the elementary classroom. Journal of Research on Computing in Education, 32, 1, 54-72.
- EVANS, N (2003). *Business Innovation and Disruptive Technology: Harnessing the Power of Breakthrough Technology ...for Competitive Advantage*. London: Financial Times/Prentice-Hall
- FABRY, D. & HIGGS, J. (1997). Barriers to the effective use of technology in education. Journal of Educational Computing Research, 17, 4, 385-395.
- FEAGIN, J., ORUM, A. & SJOBERG, G. (Eds) (1991). A case for case study, Chapel Hill, NC.: University of North Carolina Press.
- FEIST, G. J. & BARRON, F. (1996). Emotional intelligence and academic intelligence in career and life success. Annual Convention of the American Psychological Society, San Francisco, CA.
- FESSLER, R. (1995). Dynamics of teacher career stages IN GUSKEY, T. & HUBERMAN, M. (Eds) Professional Development in Education. New Paradigms and Practices. New York, Teachers College Press.
- FICHMAN, R. (1992). Information Technology Diffusion: a review of empirical research. Available: http://www2.bc.edu/~fichman/Fichman_1992_ICIS_IT_Diff_Review.pdf
- FICHTNER, B (1999). Metaphor and learning activity IN ENGESTRÖM, Y., MIETTINEN, R. & PUNAMAKI, R.-J. (2003). Perspectives on Activity Theory. Cambridge: Cambridge University Press.
- FIDLER, B. (1996). Strategic Planning for School Improvement. London: Pitman Publishing.
- FIDLER, B and BOWLES, G. (1991). ELMS Workbook: Planning Your School's Strategy. Harlow: Longman.
- FIELDING, N. G. & LEE, R. M. (Eds) (1991). Using computers in qualitative research, London: SAGE Publications, Inc.
- FINEMAN, S. (1993). Emotions in Organisations. London: SAGE Publications, Inc.
- FISHER, M. (2000). Computer skills of initial teacher education students. Technology, Pedagogy and Education, 91, 109-123.
- FLYVBERG, B. (2001). Making Social Science Matter. Cambridge, UK.: Cambridge University Press.

- FONTANA, A. & FREY, J.H. (2005). The interview from neutral stance to political involvement IN Denzin, N. & Lincoln, Y. (Eds) The SAGE Handbook of Qualitative Research (3rd edition). Thousand Oaks: SAGE Publications Inc. 695-727.
- FOREMAN, K. (1998). Vision and Mission IN Middlewood, D. & Lumby, J. (Eds) Strategic management in schools and colleges. Thousand Oaks: SAGE Publications Inc.
- FRANZ, C. & ROBEY, D. (1984). An investigation of use-led system design : rational and political perspectives. Communications of the ACM, 27, 12, 1201-1217.
- FREAR, V. & HIRSCHBUHL, J. (1999). Does interactive multimedia promote achievement and higher level thinking skills for today s science students? British Journal of Educational Technology, 304, 323-329.
- FROST, D. (1997). Reflective Action Planning for Teachers. London: David Fulton Publishers.
- FULLAN, M. (1991). The new meaning of educational change. New York: Teachers College Press.
- FULLAN, M. (2000a). Change Forces: the sequel. London: Falmer Press.
- FULLAN, M. (2000b). Planning, Doing and Coping with Change IN HARRIS, A., BENNET, N. & PREEDY, M. (Eds) Organizational effectiveness and improvement in education. Buckingham: OU Press.
- FULLAN, M. & HARGREAVES, A. (1992a). What's Worth Fighting For in Your School?, Buckingham. Open University Press.
- FULLAN, M. & HARGREAVES, A. (1992b). Teacher Development and Educational Change. London: The Falmer Press.
- FULLAN, M. & MILES, M.B. (1992). Getting reform right: What works and what doesn't. Phi Delta Kappan, 73, 10, 744-752
- GARDNER, H. (1983). Frames of Mind. New York: Basic Books.
- GATCHEL, R. J. (1995). Stress and Coping. IN PARKINSON, B. & COLMAN, A. M. (Eds) Emotion and Motivation. London and New York: Longman.
- GATIGNON, H. & ROBERTSON, T. (1989). Technology Diffusion: an empirical test of competitive effects. Journal of Marketing, 53, 35-49.
- GILLINGHAM, M. G. & TOPPER, A. (1999). Technology in teacher preparation: Preparing teachers for the future. Journal of Technology and Teacher Education, 7, 303-321.
- GLASER, B. G. & STRAUSS, A. L. (1967). The Discovery of Grounded Theory :Strategies for Qualitative Research. Hawthorne, N.Y.: Aldine de Gruyter.

- GOLDBERG, K. & SHERWOOD, R. (1983). Microcomputers: A parent's guide. New York: Wiley.
- GOLDSMITH, E. (1984). Research into Illustration: An approach and a review. Cambridge: Cambridge University Press.
- GOLEMAN, D. (1995). Emotional Intelligence. London: Bloomsbury.
- GOLEMAN, D. (1998). Working with Emotional Intelligence. London: Bloomsbury.
- GORDEN, R. (1980). Interviewing: strategies, techniques and tactics. Homewood, Il.: Dorsey.
- GRANGER, C. (2002). Factors contributing to teachers' successful implementation of IT. Journal of Computer Assisted Learning, 18, 480-488.
- GRAY, L. (2002). The impact of NOF in the use of computers in the classroom. Computer Education, 101, 15-18.
- GRAY, T. (2002). The role of emotions in planning INSET courses for IT. University of Nottingham.: Unpublished Doctoral thesis assignment.
- GRUENBERG, B. (1980). The happy worker: An analysis of educational and occupational differences in determinants of job satisfaction. American Journal of Sociology, 86, 247-271.
- GUBA, E. & LINCOLN, Y. (2005). Paradigmatic controversies, contradictions and emerging confluences IN DENZIN, N. & LINCOLN, Y. (Eds) The SAGE Publications, Inc Handbook of Qualitative Research. Third ed. California: SAGE Publications, Inc.
- GUHA, S. (2000). Are we all technically prepared? Teachers' perspectives on the causes of comfort or discomfort in using computers at elementary grade teaching. Annual Meeting of the National Association for the Education of Young Children Atlanta, GA.
- GUSKEY, T. (2002). Does it make a difference? Evaluating professional development. Educational Leadership, 59, 45-51.
- GUSKEY, T. & HUBERMAN, M. (Eds) (1995). Professional Development in Education. New Paradigms and Practices. New York: Teachers College Press.
- HADLEY, M. & SHEINGOLD, J. (1993). Commonalities and distinctive patterns in teachers integration of computers. American Journal of Education, 101, 261-315.
- HAGSTROM, D., HUBBARD, R., HURTIG, C., MORTOLA, P., OSTROW, J., WHITE, V (2000). Teaching is like...? Educational Leadership, 57, 24-27.
- HALFORD, G. (1993). Children's understanding: the development of mental models, Hillsdale, New Jersey: Lawrence Erlbaum.

- HALL, G. & LOUCKS, S. (1978). Teachers' concerns as a basis for facilitating and personalizing staff development, Teachers College Record, 80, 36-53
- HAMDEN-TURNER, C. (1995). Strategic Dilemmas occasioned by using alternative scenarios of the future IN GARRATT, B. (Ed) Developing Strategic Thought. Rediscovering the Art of Direction-Giving. Maidenhead: McGraw-Hill.
- HANDLER, M. & PIGOTT, T. (1995). Technology preparation for preservice teachers: Do they feel prepared for the 21st century classrooms? IN TISLEY, D. & VAN WEERT, T. (Eds) World conference on computers in education. London: Chapman & Hall.
- HANDY, C. (1990). Understanding Schools as Organisations. London: Penguin Books.
- HARGREAVES, A. (1994). Changing Teachers, Changing Times: Teachers' Work and Culture in the Postmodern Age. New York: Teachers' College Press.
- HARGREAVES, A. (1995). Development and Desire: a postmodern perspective IN GUSKEY, T. & HUBERMAN, M. (Eds) Professional Development in Education. New Paradigms and Practices. New York: Teachers College Press.
- HARGREAVES, A. (1998). The Emotional Practice of Teaching. Teaching and Teacher Education, 14, 835-854.
- HARGREAVES, D. & HOPKINS, D. (1990). Planning for school development. London: DES.
- HARINDRANATH, G, DYERSON, R AND BARNES, D (2008). ICT in small firms: Factors affecting the adoption and use of ICT in South East England SMEs. Available through: <http://is2.lse.ac.uk/asp/aspecis/20080076.pdf>
- HARRISON, C., FISHER, T., HAW, K., LEWIN, C., LUNZER, E., MAVERS, D., MCFARLANE, A., SRIMSHAW, P. & SOMEKH, B. (2002). ImpaCT2: Evaluation of the impact of information and communication technologies on pupil attainment. Coventry: BECTA
- HARRISON, C., YOUNGMAN, M., BAILEY, M., FISHER, T., PHILIPS, R. & RESTORICK, J. (1998). Multimedia Portables For Teachers Pilot Project Report. Coventry: BECTA.
- HARTLEY, J. (2006). Teaching, learning and new technology: a review for teachers. British Journal of Educational Technology 38, 42-62.
- HAVELOCK, P. & ZLOTOLOW, S. (1995). The Change Agent's Guide to Innovation in Education. Englewood Cliffs, N.J.: Educational Technology Publications.
- HAYES, D., SCHUCK, S., DEGA, G., DWYER, J. & MCEWEN, C. (2001). Net gain? The integration of computer-based learning in six NSW government schools. Available: http://www.curriculumsupport.nsw.edu.au/learningtechnologies/files/Lea_netgain.pdf

- HEALEY, F. & DE STEFANO, J. (1997). Education reform support: a framework for scaling up school reform. Washington, DC. : Abel 2 Clearinghouse for Education.
- HEIFITZ, R. (1994). Leadership without easy answers. Cambridge, MA: Harvard University Press.
- HIGGINS, S. (2003). Does ICT improve teaching and learning in schools? Available: [http://scholar.google.co.uk/scholar?q=HIGGINS,+S.+\(2003\)+Does+ICT+improve+teaching+and+learning+in+schools%3F&hl=en&um=1&ie=UTF-8&oi=scholar](http://scholar.google.co.uk/scholar?q=HIGGINS,+S.+(2003)+Does+ICT+improve+teaching+and+learning+in+schools%3F&hl=en&um=1&ie=UTF-8&oi=scholar)
- HITCHCOCK, G. & HUGHES, D. (1993). Research and the Teacher. London: Routledge.
- HODGKINSON, C. (1983). The Philosophy of Leadership. London: Palgrave Macmillan.
- HOEFT, R., JENTSCH, F., HARPER, M., EVANS, I., A., BOWERS, C. & SALAS, E. (2003). TPL-KATS-concept map: a computerized knowledge assessment tool. Computers in Human Behavior, 19, 653-657.
- HOFFMAN, B. (1996). What drives successful technology planning? Technology, Pedagogy and Education, 5, 43-55.
- HOLSTEIN, J. & GUBRIUM, J. (1995). The active interview. Thousand Oaks, California: Sage.
- HONG K-S. & KOH, C-K (2002). Computer Anxiety and Attitudes toward Computers among Rural Secondary School Teachers: A Malaysian Perspective. Journal of Research on Technology in Education, 35, 1, 27-48.
- HONEY, M. & MCMILLAN CULP, K. (1996). Case studies of K-12 educators use of the Internet: Exploring the relationship between metaphor and practice. Center for Children & Technology. Available: http://eric.ed.gov/ERICDocs/data/ericdocs2sql/content_storage_01/0000019b/80/15/ce/fa.pdf
- HOPKINS, D. (1996). Towards a theory of school improvement. IN GRAY, J., REYNOLDS, D. & FITZ-GIBBON, C. (Eds) Merging Traditions: The future of research on school effectiveness and school improvement. London: Cassell.
- HORD, S., RUTHERFORD, W., HULING-AUSTIN, L., HALL, G. & AL, E. (1987). Taking charge of change. Association for Supervision and Curriculum Development. Available: http://eric.ed.gov/ERICDocs/data/ericdocs2sql/content_storage_01/0000019b/80/30/4f/80.pdf
- HOWARD K. 1997. IT Means Business? A Survey of Attitudes in Smaller Businesses to Information and Technology. London: Institute of Management.
- HOWARTH, A. (1999). New Labour's Information Age. The Electronic Library, 17, 143-145.
- HOWLAND, J. & WEDMAN, J. (2004). A Process Model for Faculty Development: Individualizing Technology Learning. Journal of Technology and Teacher Education, 12, 239-263.

- HUBERMAN, M. (1988). Teacher careers and school improvement. Journal of Curriculum Studies 20, 119-133.
- HUBERMAN, M. (1995). Professional Careers and Professional Development. IN GUSKEY, T. & HUBERMAN, M. (Eds) Professional Development in Education. New Paradigms and Practices. New York: Teachers College Press.
- HUBERMAN, M. & MILES, M. (2002).. The Qualitative researcher's companion. Thousands Oaks, California: SAGE Publications Inc.
- HUNT, D. (1971). Matching Models in Education, Toronto: Ontario Institute for Studies in Education.
- ILLICH, I. (1973). Deschooling Society. Harmondsworth: Penguin.
- JACOBSEN, M., CLIFFORD, P. & FRIESEN, S. (2002). Preparing teachers for technology integration: Creating a culture of inquiry in the context of use. Contemporary Issues in Technology and Teacher Education, 23, 363-388.
- JAMES, W. (1935). Selected Papers in Philosophy, London: J M Dent and Sons.
- JAMES, W. (2008). The Principles of Psychology. USA: Hesperides Press.
- JEGEDE, O., ALAIYEMOLA, F. & OKEBUKOLA, P. (1990). The effect of concept mapping on students anxiety and achievement in biology. Journal of Research in Science Teaching, 27, 951-960
- JICK, T. D. (1979). Mixing Qualitative and Quantitative Methods: Triangulation in Action. Administrative Sciences Quarterly, 24, 602-611.
- JOHNSON-GENTILE, K., LONBERGER, R., PARANA, J. & WEST, A. (2000). Preparing preservice teachers for the technological classroom: A school-college partnership. Journal of Technology and Teacher Education, 8, 97-109.
- JONASSEN, D., REEVES, T., HONG, N., HARVEY, D. & PETERES, K. (1997). Concept mapping as cognitive learning and assessment tools. Journal of Interactive Learning Research, 8, 289-308.
- JONES, A. (2004). A Review of the research literature on barriers to the uptake of ICT by teachers, Coventry: UK, BECTA.
- KANKAANRANTA, M. (2001). Constructing digital portfolios; teachers evolving capabilities in the use of information and communications technology. Teacher Development, 2, 259-275.
- KAY, P. H. (1989). Gender differences in computer attitudes, literacy, focus of control and commitment. Journal Research on Computing in Education, 21, 307-316.
- KAY, R. (2006). Evaluating Strategies Used to Incorporate Technology into Preservice Education: A Review of the Literature. Journal of Research on Technology in Education, 38, 38-408.

- KENNEWELL, S. (1997). Computer modelling and the curriculum -- integrated or loosely attached? Education and Information Technologies, 2, 247-260.
- KENNEWELL, S. (2001). Using affordances and constraints to evaluate the use of information and communications technology. Technology, Pedagogy and Education, 10, 135-141.
- KENNEWELL, S., PARKINSON, J. & TANNER, H. (2000). Developing the ICT capable school. London: Routledge Falmer.
- KENWAY, J. (1995). Reality bytes: education, markets and the information superhighway. Australian Educational Researcher, 22, 35-65.
- KINCHIN, I. (1998). Constructivism in the classroom: mapping your way through. Paper presented at the British Educational Research Association Annual Student Conference. The Queen's University of Belfast.
- KINCHIN, I. (2000). Using concept maps to reveal understanding: a two tier analysis. School Science Review, 81, 41-46.
- KINCHIN, I. & HAY, D. (2000). How a qualitative approach to concept map analysis can be used to aid learning by illustrating patterns of conceptual development. Educational Research, 42, 43-57.
- KINDER, H., HARLAND & WOOTEN, M. (1991). The impact of school-focused INSET on classroom practice. Slough: NFER.
- KIRIDIS, A., DROSSOS, V. & TSAKIRIDOU, E. (2006). Teachers Facing ICT: The Case of Greece. Journal of Technology and Teacher Education, 14, 75-96.
- KIRKMAN, C. (2000). A model for the effective management of information and communications technology development in schools derived from six contrasting case studies. Technology, Pedagogy and Education, 9, 37-52.
- KIRKWOOD, M., VAN DER KUYL, T., PARTON, N. & GRANT, R. (2000). The New Opportunities Fund (NOF):ICT training for teachers programme: Designing a powerful online learning environment. European conference on educational research. Edinburgh.
- KLEIN, D. C., CHUNG, G. K., OSMUNDSON, E., HERL, H. E. & O NEILL, H. F. (2001). Examining the validity of knowledge mapping as a measure of elementary students' scientific understanding. Los Angeles: National Centre for Research on Evaluation, Standards, and Student Testing (CRESST).
- KNEZEK, G. & CHRISTENSEN, R. (1997). Internal Consistency Reliability for the Teachers' Attitudes Toward Information Technology (TAT) Questionnaire. Denton, TX: Texas Centre for Educational Technology.
- KNEZEK, G. & CHRISTENSEN, R. (2002). Impact of New Information Technologies on Teachers and Students. Education and information technologies, 7, 369-376.

- KOOHANG, A. A. (1987). A study of the attitudes of preservice teachers towards the use of computers. Educational Communications and Technology Journal, 35, 145-149.
- KOZMA, R. B. & ANDERSON, R. E. (2002). Qualitative case studies of innovative pedagogical practices using ICT. Journal of Computer Assisted Learning, 18, 387-394.
- KUMAR, R. (1999). Research methodology: a step by step guide for beginners. London: SAGE Publications, Inc.
- KVALE, S. (1996). Interviews: an introduction to qualitative research interviewing., California: SAGE Publications, Inc.
- LABAREE, R. (2002). The risk of 'going observationalist': negotiating the hidden dilemmas of being an insider participant observer. Qualitative Research, 2, 97-122.
- LARNER, D. K. & TIMBERLAKE, L. M. (1995). Teachers with Limited Computer Knowledge: Variables Affecting Use and Hints To Increase Use. Available: http://eric.ed.gov/ERICDocs/data/ericdocs2sql/content_storage_01/0000019b/80/14/0f/30.pdf
- LAURILLARD, D. (2008). Digital technologies and their role in achieving our educational ambitions -
Professorial lecture. Available: www.lkl.ac.uk/cms/files/jce/presentations/laurillard-inaugral-20080226.ppt
- LAWLESS, C., SMEE, P. & O SHEA, T. (1998). Using concept sorting and concept mapping in business and public administration and in education: an overview. Educational Research, 40, 219-235.
- LAWLESS, K. & PELLEGRINO, J. (2007). Professional development in integrating technology into teaching and learning: knowns, unknowns and ways to pursue better questions and answers. Review of Educational Research, 77, 575-614.
- LAWLEY, J. & TOMPKINS, P. (2003). Metaphors in Mind, London: The Developing Company Press.
- LAWSON, T. & COMBER, C. (1999). 'Superhighways technology: personnel factors leading to successful integration of information and communications technology in schools and colleges', Technology, Pedagogy and Education, vol 8, no 1, pp41-53
- LAY-DOPYERA, M. & BEYERBACK, B. (1983). Concept mapping for individual assessment. The annual meeting of the American Educational Research Association. Montreal, Quebec.
- LAZARUS, R. S. (1991). Emotion and Adaption, Oxford: Oxford University Press.
- LEE, R. M. (2000). Unobtrusive methods in social research, Buckingham: Open University Press.
- LEITCH, S. (2006). Prosperity for all in the global economy: world class skill., Norwich: HMSO.

- LEVIN, D. & ARAFEH, S. (2002). The digital disconnect: The widening gap between internet-savvy students and their schools. American Institutes for Research for Pew Internet & American Life Project. Washington, DC. Available: http://www.pewinternet.org/PPF/r/67/report_display.asp
- LEVY, F. & MURNANE, F. J. (2004). A role for technology in professional development? Lessons from IBM. Phi Delta Kappan, 85, 728-734.
- LIGHTHALL, F. (1973). Multiple realities and organisational non-solutions. School Review, 81, 254-293.
- LIM, C. & HANG, D. (2003). An activity theory approach to research of ICT integration in Singapore schools. Computers and Education, 141, 1, 49-63.
- LINCOLN, Y. & GUBA, E. (1985). Naturalistic Inquiry. California: SAGE Publications, Inc.
- LITTLE, J. (1993). Professional Community in comprehensive high schools IN LITTLE, J. & MCLAUGHLIN, M. (Eds) Teachers s work: Individuals, colleagues and contexts. New York: Teachers College Press.
- LLOYD, B & GRESSARD, C (1986). Gender and amount of computer experience of teachers in staff development programs: effects on computer attitudes and perceptions of the usefulness of computers. AEDS Journal, 18, 3, 302-311.
- LLOYD, M. (2003). A connected community: Teachers' perceptions of using ICT to meet the needs of Indigenous students living away from home. Available: <https://eprints.qut.edu.au/secure/00003571/01/llo03060.pdf>
- LOMASK, M., BARON, J. B., GREIG, J. & HARRISON, C. (1992). ConnMap: Connecticut s use of concept mapping to assess the structure of students' knowledge of science. Symposium presented at the annual meeting of the National Association for Research in Science Teaching. Cambridge, MA.
- LORTIE, D. (1975). Schoolteacher: a sociological study. Chicago: University of Chicago Press.
- LOUCKS-HORSLEY, S. & BYBEE, E. (2000). Advancing technology education: the role of professional development. Technology Teacher, 60, 31-34.
- LOUGHRAN, J. (1996). Developing Reflective Practice: Learning About Teaching and Learning Through Modelling. London: Falmer Press.
- LOUIS, K. & MILES, M. (1990). Improving the Urban High School, New York, Teachers College Press.
- LOWE, D. (1982). History of bourgeois perception, Chicago: University of Chicago Press.
- LUCKIE, D., HARRISON, S. & EBERT-MAY, D. (2004). Introduction to C-Tools: Concept mapping tools for online learning. Available: <http://ctools.msu.edu/about/cmc2004-039.pdf>

- MACCORMAC, E. (1990). A cognitive theory of metaphor, Cambridge, MA: MIT Press.
- MACGILCHRIST, B. & BUTTRESS, M. (2005). Transforming Learning and teaching, London: Paul Chapman Publishing.
- MACGILCHRIST, B., MYERS, K. & REED, J. (2004). The Intelligent School, London: Sage.
- MAKRAKIS, V. (1993). Gender and computing in schools in Japan: the 'we can, I can't' paradox. Computers and Education, 20, 191-198.
- MAKRAKIS, V. (1997). Perceived relevance of information technology courses to prospective teachers' professional needs: the case of Greece. Technology, Pedagogy and Education, 16, 157-167.
- MALINOWSKI, B. (1922). Argonauts of the Western Pacific, London, Routledge and Kegan Paul.
- MALMLOW, E. (1972). Corporate Strategic Planning in Practice. Long Range Planning, 9, 2-9.
- MALONE, J. & DEKKERS, J. (1984). The concept map as an aid to instruction in science and mathematics. School Science and Mathematics, 84, 221-231.
- MARKHAM, K., MINTZES, J. & JONES, M. (1994). The concept map as a research and evaluation tool: further evidence of validity. Journal of Research in Science Teaching, 31, 91-101.
- MARKUS, M. (1987). Toward a 'Critical Mass' Theory of Interactive Media: Universal Access, Interdependence and Diffusion. Communications Research, 14, 491-511.
- MARTON, F. (1994). Phenomenography IN HUSEN, T. & POSTLETHWAITE, T. (Eds) The International Encyclopedia of Education, Oxford: Pergamon.
- MARTON, F. & FAI, P. (1999). Two faces of variation. The 8th European Conference for learning and instruction. Goteburg Univeristy, Sweden.
- MASLOW, A. (1987). Motivation and Personality, New York: Harper Collins.
- MASON, C. (1992). Concept mapping: A tool to develop reflective science instruction. Science Education, 74, 473-480.
- MATTHEWS, P. (2007). ICT assimilation and SME expansion. Journal of International Development, 19, 817-827.
- MAVERS, D., SOMEKH, B. & RESTORICK, J. (2002). Interpreting the externalised images of pupils' connections of ICT: methods for the analysis of concept maps. Computer and Education, 38, 187- 207.
- MAYER, J. D. (2001). Emotion, Intelligence and Emotional Intelligence IN FORGAS, J. (Ed) Affect and Social Cognition. New Jersey, Lawrence Erlbaum Associates.

- MAYER, J. D., CARUSO, D. & SALOVEY, P. (1999). Emotional Intelligence meets traditional standards for an intelligence. Intelligence, 27, 267-298.
- MAYER, J. D. & SALOVEY, P. (1993). The intelligence of emotional intelligence. Intelligence, 17, 433-442.
- MAYKUT, P. & MOORHOUSE, R. (1994). Beginning Qualitative Research - a Philosophical and Practical Guide. London: Falmer Press.
- MCCARNEY, J. (2004). Effective models of staff development in ICT. European Journal of Teacher Education, 27, 61-72.
- MCKENZIE, J. (1991). Designing Staff Development for the Information Age.
Available: www.fno.org/fnoapr91.html
- MCKINSEY AND COMPANY (1997). The Future of Information Technology in UK Schools.
London: McKinsey & Company.
- MCLAY, M. & BROWN, M. (2003). Using concept maps to evaluate the training of primary school leaders. International Journal of Leadership in Education, 6, 73-87.
- MCLUHAN, M (1993). Understanding Media: the extension of man. London: Sphere Books.
- MCLUHAN, M. & FIORE, Q. (1997). War and Peace in the Global Village. San Francisco: Hard Wired.
- MECHANIC, D. (Ed) (1967). Invited commentary. New York: Hemisphere.
- MELLON, C. (1999). Technology and the great pendulum of education. Journal of Research on Computing in Education, 32, 1, 28-36.
- MIETTINEN, R. (1997). The concept of activity in the analysis of heterogeneous networks in innovation process. Available:
<http://communication.ucsd.edu/MCA/Paper/Reijo/Reijo.html#Introduction>
- MILES, M. & HUBERMAN, A. (1984). Analyzing qualitative data: a source book for new methods. California: SAGE Publications, Inc.
- MINTZBERG, H. (1979). An emerging strategy of "direct" research. Administrative Science Quarterly, 24, 58-589.
- MINTZBERG, H. (1994). The rise and fall of strategic planning: Reconceiving roles for planning, plans, planners. New York: Free Press.
- MINTZBERG, H. & MCHUGH, A. (1985). Strategy formation in an adhocracy. Administrative Science Quarterly, 25, 465-499.

- MIODUSER, D., TUR-KASPA, H. & LEITNER, I. (2000). The learning value of computer-based instruction of early reading skills. Journal of Computer Assisted Learning, 16, 54-63.
- MORTIMORE, P., SAMMONS, P., STOLL, L., LEWIS, D. & ECOB, R. (1994). Key factors for effective junior schooling IN POLLARD, A. & BOURNE, J. (Eds) Teaching and learning in the primary school. London: Routledge.
- MUMTAZ, S. (2000). Factors affecting teachers' use of information technology: a review of the literature. Technology, Pedagogy and Education, 9, 3, 319-342.
- MUNN, P. & DREVER, E. (2004). Using questionnaires in small-scale research, Glasgow: The SCRE Centre, University of Glasgow.
- NATIONAL CENTER FOR EDUCATIONAL STATISTICS (2000). Teachers' tools for the 21st century: A report on teachers use of technology. Washington, DC.
- NEGROPONTE, N. (1995). Being Digital. New York: Vintage Books.
- NELSON, R. R., & WINTER, S. G. (1982). An evolutionary theory of economic change. Cambridge, Mass: Belknap Press of Harvard University Press.
- NGFL (National Grid for Learning) (2000). Recommended NOF/ICT training providers (The 'red file'), London: New Opportunity Fund (NOF).
- NIEDERHAUSER, D. & STODDART, T (2001). Teachers' instructional perspectives and use of educational software. Teaching & Teacher Education, 17, 1, 15-31.
- NISBET, J. & WATT, J. (1980). Case Study, Nottingham: University of Nottingham, School of Education.
- NONAKA, I. (1991). The Knowledge-Creating Company. Harvard Business Review, 69, 96-104.
- NOVAK, J. (1998). Learning, Creating and Using Knowledge: Concept maps as Facilitative Tools in Schools and Corporation., New Jersey: Lawrence Erlbaum Associates.
- NOVAK, J. & CAÑAS, A. J. (2006). The Theory Underlying Concept Maps and How to Construct Them. Technical Report IHMC CmapTools. Florida Institute for Human and Machine Cognition.
- NOVAK, J. & GOWIN, D. (1984). Learning How to Learn. Cambridge: Cambridge University Press.
- NOVAK, J. D. & MUSONDA, D. (1991). A twelve-year longitudinal study of science concept learning. American Educational Research Journal, Spring, 117-153.
- OATLEY, K. (1991). Best Laid Schemes: The Psychology of Emotion., Cambridge: Cambridge University Press.

- OFSTED (2000). National Literacy Strategy: the third year, London: OfSTED.
- OFSTED (2001a). National Numeracy Strategy: the second year, London: OfSTED.
- OFSTED (2001b). ICT in Schools. The Impact of Government Initiatives. An Interim Report April 2001, London: OfSTED.
- OFSTED (2002a). The National Numeracy Strategy: the first three years 1999- 2002. London: HMSO.
- OFSTED (2002b). The National Literacy Strategy: the first four years 1998- 2000, London: HMSO.
- OFSTED (2002c). ICT in Schools: Effect of Government Initiatives on Pupils' Achievement, London: OfSTED.
- OFSTED (2005). Embedding ICT in schools - a dual evaluation exercise, London: OfSTED.
- OHNUKI-TIERNEY, E. (1984). "Native" Anthropologists. American Ethnologist, 11, 584-586.
- OLIVER, R. (1994). Factors influencing beginning teachers uptake of computers. Journal of Technology and Teacher education, 13, 43-51.
- OSTERMAN, K. & KOTTKAMP, R. (1993). Reflective Practice for Educators: Improving Schools Through Professional Development. London: SAGE Publications, Inc.
- OTA OFFICE OF TECHNOLOGY ASSESSMENT, U. S. C. (1995). Teachers & technology: Making the connection, Washington, D.C.: U.S. Government Printing Office.
- PANT, P.N. & STARBUCK W.H. (1990). Innocents in the forest: Forecasting and research methods, Journal of Management, 16, 433 - 460
- PARKER, B. & BOWELL, B. (1998). Exploiting computer mediated communications to support in-service professional development: the SENCO experience. Journal of Information Technology for Teacher education, 7, 229-246.
- PARKINSON, B. & COLMAN, A. (1995). Emotion and Motivation, New York: Longman.
- PARLETT, M. and HAMILTON, D. (1977).. Evaluation as illumination: a new approach to the study of innovatory programmes. In: HAMILTON, D., JENKINS, D., KING, C., MACDONALD, B. & PARLETT, M. (Eds). Beyond the numbers game. London: Macmillan.
- PASCALE, R. (1990). Managing on the edge. St. Ives: Penguin Books.
- PATTON, M. (1991). Qualitative Research on College Students: Philosophical and methodological comparisons with the quantitative approach. Journal of College Student Development, 32, 389-396.

- PEJOUHY, N. (1990). Teaching Math for the 21st century. Phi Delta Kappan, 72, 76-78.
- PELGRUM, W. J. (2001). Obstacles to the integration of ICT in education: results from a worldwide educational assessment. Computers and Education, 37, 163-178.
- PERSICHITTE, K. A. & BAUER, J. W. (1996). Diffusion of Computer-based Technologies: getting the best start. Technology, Pedagogy and Education, 51, 8-12.
- PETRIE, H. (1980). Metaphor and learning. IN ORTONY, A. (Ed) Metaphor and thought. Cambridge: Cambridge University Press.
- PETTIGREW, A. (1988). Longitudinal Field Research on Change Theory and Practice. National Science Foundation Conference on Longitudinal Research Methods. Austin.
- PIANFETTI, S. (2001). Teachers and Technology: digital literacy through professional development. Language Arts, 78, 255-262.
- PIAVE, N. & IADECOLA, G. (2009). How to reduce the current digital gap between teachers and students in Italian Schools: a proposal. 5th International Scientific Conference – eLearning and Software for Education. Bucharest, Hungary. April 9-10. Available online: http://adlunap.ro/else2009/papers/1003.1.Piave_%20Iadecola.pdf
- PIERSON, M. E. & MCNEIL, S. (2000). Preservice technology integration through collaborative action communities. Contemporary Issues in Technology and Teacher Education, 1, 189-199.
- PLANOW, M. (1993). Structuring teachers' attitudinal changes : a follow-up study IN WILLIS, J. & CAREY, E. (Eds) Technology and Teacher Education Annual. Charlottesville, VA: Association for the Advancement of Computing in Education.
- POLLARD, A. (1982). A model of coping strategies. British Journal of Sociology of Education, 3, 19-37.
- POLLARD, A. (1996). Readings for Reflective Teaching in Primary Schools. London: Cassell.
- POTTER, J. & MELLAR, H. (2000). Identifying teachers' training needs. Technology, Pedagogy and Education, 9, 23-36.
- PRESTON, C., COX, M. & COX, K. (2000). Teachers as innovators: an evaluation of the motivation of teachers to use information and communications technology. South Croyden: MirandaNet.
- PRICE, WATERHOUSE, COOPERS. (2001). Teacher workloads study: Interim report for the DfES. Available: <http://www.dcsf.gov.uk/research/data/uploadfiles/DCSF-RR065.pdf>
- PROCHASKA, J. O., DICLEMENTE, C. C. & NORCROSS, J. C. (1993). In Search of How People Change: Applications to Addictive Behaviours. Journal of Addictions Nursing, 5, 1, 2-16.

- RAVEN, J. (2005). How not to integrate computers with group projects: an example from the field. Technology, Pedagogy and Education, 14, 255-268.
- REAGAN, T., CASE, C., BRUBACHER, J. & (2000). Becoming a Reflective Educator: How to Build a Culture of Inquiry in the Schools. London: SAGE Publications, Inc.
- REYNOLDS, D., TREHARNE, D. & TRIPP, H. (2003). ICT - the hopes and the reality. British Journal of Educational Technology, 34, 157-167.
- RICE, D., RYAN, M. & SAMSON, S. (1998). Using Concept Maps to Assess Student Learning in the Science Classroom: Must Different Methods Compete? Journal of Research in Science Teaching, 35, 1103-1127.
- RICHARDS, C. (2000). Getting the Picture: Diagram Design and the Information Revolution Information Design Journal, 9, 87-110.
- RICHARDSON, V. (2003). The dilemmas of professional development. Phi Delta Kappan, 84, 401-06.
- RICHES, C. (1994). Motivation IN BUSH, T. & WEST-BURNHAM, J. (Eds) The Principles of Education Management. Edinburgh: Pearson Educational.
- RITZER, G. (1996). The McDonaldization of Society, California: Pine Forge Press.
- ROBERTS, L. (1999). Using concept maps to measure statistical understanding. International Journal of Mathematical Education in Science and Technology, 130, 707-717.
- ROBERTSON, J. (1997). Does permeation work? Promoting the use of information technology in teacher education. Technology, Pedagogy and Education, 62, 169-184.
- ROBINSON, B. (1997). Getting ready to change: The place of change theory in the information technology education of teachers IN PASSEY, D. & SAMWAYS, B. (Eds) Information technology. Supporting change through teacher education. London: Chapman and Hall.
- ROGERS, E. (1995). Diffusion of Innovations (4th edition). New York, Free Press.
- ROGERS, E. (2003). Diffusion of Innovations (5th edition). New York, Free Press.
- RONEN, M. & ELIAHU, M. (2000). Simulation - a bridge between theory and reality: the case of electric circuits. Journal of Computer Assisted Learning, 16, 14-26.
- ROSEN, L. D. & WEIL, M. M. (1995). Computer Availability, Computer Experience and Technophobia Among Public School. Teachers and Computers in Human Behaviour, 11, 9-31.
- ROTH, W. M. & ROYCHOUDHURY, A. (1992). The social construction of scientific concepts or the concept map as conscription device and tool for social thinking in high school science. Science Education, 76, 531-557.

- ROTH, W. M. & ROYCHOUDHURY, A. (1993). The concept map as a tool for the collaborative construction of knowledge: A microanalysis of high school physics students. Journal of Research in Science Teaching, 30, 503-534.
- RUIZ-PRIMO, M. A. & SHAVELSON, R. J. (1996). Problems and issues in the use of concept maps in science assessment. Journal of Research in Science Teaching, 33, 569-600.
- RUSSELL, G. & BRADLEY, G. (1997). Teachers' computer anxiety: implications for professional development Journal, Education and Information Technologies, 2, 1, 17-30.
- RUSSELL, M., BEBELL, D., O'DWYER, L. & O'CONNOR, K. (2003). Examining teacher technology use: Implications for preservice and inservice teacher preparation. Journal of Teacher Education, 54, 297-310.
- RUTTER, M., MAUGHAN, B, MORIMORE, P. and OUSTON, J. (1979). Secondary Schools and their effects on children. Cambridge, Mass: Harvard University Press.
- RYDER, M. (1998). Spinning Webs of Significance.
Available: http://carbon.cudenver.edu/~mryder/iscrat_99.html
- SAHIN, I. & THOMPSON, A. (2006). Using Rogers theory to interpret instructional computer use by COE faculty. Journal of Research of Technology in Education, 39, 81-104.
- SALOVEY, P., BEDELL, B., DETWEILER, J. B. & MAYER, J. D. (1999). Coping intelligently: Emotional intelligence and the coping process. IN SNYDER, C. R. (Ed) Coping: The psychology of what works. New York: Oxford University Press.
- SALOVEY, P. & MAYER, J. (1990). Emotional intelligence. Imagination, Cognition, and Personality, 93, 185-211.
- SALZBERGER-WITTENBERG, I., HENRY, G. & OSBORNE, E. (1983). The emotional experience of teaching and learning., London: Routledge and Kegan Paul.
- SANDHOLTZ, J. (2001). Learning to teach with technology: a comparison of teacher development programs. Journal of Technology and Teacher Education, 9, 349-374.
- SANTHANAM, E., LEACH, C. & DAWSON, C. (1998). Concept mapping: how should it be introduced and is there evidence for long term benefits? Higher Education, 35, 317-328.
- SAVAGE, D. (Ed) (1999). ICT in UK State Schools, London: BESA.
- SCHEIN, E. H. (2006). Kurt Lewin's Change Theory in the Field and in the Classroom: Notes Towards a Model of Managed Learning. Available:
http://www.a2zpsychology.com/articles/kurt_lewins_change_theory.htm
- SCHON, D. (1995). The Reflective Practitioner: How Professionals Think in Action. Aldershot, Hants: Arena.

- SCRIMSHAW, P. (2004). Enabling teachers to make successful use of ICT. Coventry: BECTA.
- SCULLY, J. (1987). Odyssey: Pepsi to Apple – a journey of Adventure, Ideas and the Future. New York: Harper and Row
- SEELS, B., CAMPBELL, S. & TALSMA, V. (2003). Supporting excellence in technology through communities of learning. Educational Technology Research and Development, 51, 91-104.
- SELWYN, N. (1999). Why the computer is not dominating schools: a failure of policy or practice? Cambridge Journal of Education, 29, 77-91.
- SENGE, P. N. (1992). The Fifth Discipline. Kent: Century Business.
- SHACKEL, B. (2004). A user's experience. British Journal of Educational Technology, 35, 645-656.
- SHAH, P. & CARPENTER, P. A. (1995). Conceptual limitations in comprehending line graphs. Journal of Experimental Psychology: General, 124, 43-61.
- SHORTIS, T. (2001). The Language of ICT. London: Routledge.
- SIKES, J. (1992). Imposed change and experienced teachers IN FULLAN, M. & HARGREAVES, A. (Eds) Teacher Development and Educational Change. London: The Falmer Press.
- SIMPSON, M., PAYNE, F., R., M. & LYNCH, E. (1998). Using information and communications technology as a pedagogical tool: a survey of initial teacher. Technology, Pedagogy and Education, 7, 301 - 308.
- SKAGER, R. & WEINBERG, C. (1971). Fundamentals of Educational Research. Illinois: Scott Foresman and Co.
- SKINNER, B. F. (1953). Science and Human Behaviour. New York: Macmillan.
- SNOEYINK, R. & ERTMER, P. (2001). Thrust into technology: how veteran teachers respond. Journal of Educational Technology Systems, 30, 85-111.
- SNOW, D. & ANDERSON, L (1991). Researching the Homeless: The characteristic features and virtues of the case study IN FEAGIN, J., ORUM, A. & SJOBERG, G. (Eds) (1991). A case for the case study. Chapel Hill, NC: University of North Carolina Press.
- SOMEKH, B. & MAVERS, D (2003). Mapping Learning potential: students' conceptions of ICT in their world. Assessment in Education, 10, 3, 409-420.
- SPENCER, L. & SPENCER, S. (1993). Competency at Work: Models for Superior Performance, New York: John Wiley and Sons.
- STACEY, M. (1969). Methods of social research. Oxford: Pergamon.

- STACEY, R. (2000). Strategic management and organisational dynamics: the challenges of complexity. London: Prentice Hall and Financial Times.
- STAKE, R. (1995). The Art of Case Study Research. California: SAGE Publications, Inc.
- STAKE, R. (2005). Qualitative Case Studies. IN DENZIN, N. & LINCOLN, Y. (Eds) The SAGE Publications, Inc Handbook of Qualitative Research. Third ed. California, SAGE Publications, Inc.
- STARK, R., SIMPSON, M., GRAY, D. & PAYNE, F. (2002). The Impact of Information and Communication Technology Initiatives on Scottish Schools. Glasgow: University of Strathclyde.
- STARR, M. L. & KRAJCIK, J. S. (1990). Concept maps as a heuristic for science curriculum development: Toward improvement in process and product. Journal of Research in Science Teaching, 27, 987-1000.
- STEADMAN, S., ERAUT, M., FILEDING, M. & HORTON, A. (1995). Making school-based INSET Effective. Brighton: University of Sussex Institute of Education.
- STEINER, G. (1979). Strategic Planning. What Every Manager Should Know. New York: Free Press.
- STENHOUSE, L. (1998). Case study methods. IN KEEVEES, J. P. (Ed) Educational Research, Methodology and Measurement: an International Handbook 1st ed. Oxford: Pergamon.
- STEVENSON, D. (Ed) (1997a). The Future of Information Technology in UK Schools. London: McKinsey and Co.
- STEVENSON, D. (1997b). Information and Communication Technology in schools: an independent inquiry. London: Independent ICT in Schools Commission
- STODDART, T., ABRAMS, R., GASPER, E. & CANADAY, D. (2000). Concept maps as assessment in science inquiry learning - a report of methodology. International. Journal of Science Education, 22, 1221-1246.
- STRAUSS, A. & CORBIN, J. (1990). Basics of Qualitative Research: Grounded Theory, Procedures and Techniques. Newbury Park, Ca: SAGE Publications, Inc.
- STRUDLER, N., ARCHAMBAULT, L., BENDIXEN, L., ANDERSON, D. & WEISS, R. (2003). Project THREAD: Technology helping restructure educational access and delivery. Educational Technology Research and Development, 51, 39-54.
- STUART, H. (1985). Should concept maps be scored numerically? European Journal of Science Education, 7, 3-8.
- SUMMERS, M. (1988). New primary teacher trainees and computers: where are they starting from? Journal of Education for Teaching, 14, 183-190.

- SUMMERS, M. (1990). Starting teacher training: new PGCE students and computers. British Educational Research Journal, 16 79-87.
- SUTTON, R., & WHEATELY, K. (2003). Teachers' emotions and teaching: A review of the literature and directions for future research. Educational Psychology Review, 15, 327-358.
- TASHAKKORI, A. & TEDDLIE, C. (1998). Mixed methodology. Combining Qualitative and Quantitative Approaches. Thousand Oaks, CA.: SAGE Publications, Inc.
- TEARLE, P. (2003). ICT implementation: what makes a difference? British Journal of Educational Technology, 34, 567-583.
- TENNANT, M. (1997). Psychology and Adult Learning, London: Routledge.
- TESCH, R. (1990). Qualitative Research: Analysis, Types and Software Tools. Basingstoke: Falmer Press.
- THOMPSON, A. D., SCHMIDT, D. A. & DAVIS, N. E. (2003). Technology collaborative for simultaneous renewal in teacher education. Educational Technology Research and Development, 51, 73-89.
- THORNDIKE, E. L. (1920). Intelligence and its uses. Harper s Magazine, 140, 227-235.
- THORNGATE, W. (2006). The Seductive Danger of Visual Metaphors: It's About Time. Culture & Psychology, 12, 215-219.
- TOFFLER, A. (1990). The Third Wave. New York: Batman Books.
- TOPP, N., MORTENSEN, R., & GRANDGENETT, N. (1995). Building a technology-using faculty to facilitate technology-using teachers. Journal of Computing in Teacher Education, 113, 11-14.
- TRAVERS, M. (2001). Qualitative research through case studies. London: SAGE Publications, Inc.
- TREACY, B., KLEIMAN, G. & PETERSON, K. (2002). Successful online professional development. Learning and Leading with Technology, 20, 42-47.
- UNDERWOOD, J. (2000). A comparison of two types of computer support for reading development. Journal of Research in Reading, 23, 136-148.
- UNDP (United Nations Development Programme) (2006). Why Should Countries Embed ICTs Into SME Policy. APDIP e-Note 4/2005. Available from: <http://www.apdip.net/apdipenote/4.pdf>
- VAN FOSSEN, P. (1999). "Teachers Would Have To Be Crazy Not To Use the Internet!": A Preliminary Analysis of the Use of the Internet/WWW by Secondary Social Studies Teachers in Indiana. Annual Meeting of the National Council for the Social Studies. Orlando, FL.

- VAUGHAN, D. (1992). Theory elaboration: the heuristics of case analysis IN RAGIN, C. & BECKJER, H. (Eds) What is a case? Exploring the foundations of social enquiry. Cambridge: Cambridge University Press.
- VILE, A. & POLOVINA, S. (1998). Thinking of or thinking through diagrams? The case of conceptual graphs. Available: <http://www.aber.ac.uk/~plo/TwD98>
- VYGOTSKY, L. (1978). Mind in Society. IN COLE, M., JOHN-STEINER, V., SCRIBNER, S. & SOUBERMAN, E. (Eds). The Development of Higher Psychological Processes. Cambridge, Mass, Harvard University Press.
- VYGOTSKY, L. (1986). Thought and language. Cambridge, MA: MIT Press.
- WALKER, R. (1983). Three good reasons for not doing case studies in curriculum research. Journal of Curriculum Studies, 15, 155-156.
- WALLACE, J. D. & MINTZES, J. J. (1990). The concept map as a research tool: Exploring conceptual change in biology. Journal of Research in Science Teaching, 27, 1033-1052.
- WALACE, M. (1991). Educational Management Administration and Leadership. California: SAGE Publications Inc.
- WANDERSEE, J. (1990). Concept mapping and the cartography of cognition. Journal of research in Science teaching, 27, 932-936.
- WATSON, G. (1997). Pre-service teachers' views on their information technology education. Technology, Pedagogy and Education, 6, 255-270.
- WEINSTEIN, B. (1995). The use of scenario thinking: can a scenario a day keep the business doctor away? IN GARRETT, B. Developing Strategic Thought. Rediscovering the Art of Direction-Giving. Maidenhead, McGraw-Hill.
- WEPNER, S. B., ZIOMEK, N. & TAO, L. (2003). Three teacher educators' perspectives about the shifting responsibilities of infusing technology into the curriculum. Action in Teacher Education, 24, 53-63
- WEST-BURNHAM, J. (1994). The Principles of Educational Management. Harlow: Longman.
- WEST-BURNHAM, J. & O'SULLIVAN, F. (1998). Leadership and Professional Development in Schools. London: Prentice Hall.
- WETZEL, K. (2001a). Preparing teacher leaders. Learning & Leading with Technology, 293, 50-53.
- WETZEL, K. (2001b). Reaching students with emotional disabilities: A partnership that works, part 1. Learning & Leading with Technology, 292, 26-27.

- WETZEL, K., ZAMBO, R., BUSS, R. & PADGETT, H. (2001). A picture of change in technology-rich K-8 classrooms. National Educational Computing Conference. Chicago.
- WHETSTONE, L. & CARR-CHELLMAN, A. (2001). Preparing preservice teachers to use technology: Survey results. Tech Trends, 45, 4, 11-17.
- WHITE, R. & GUNSTONE, R. (1992). Probing Understanding. New York: Farmer Press.
- WHITAKER, P. (1993). Managing Change in Schools. Milton Keynes: Open University Press.
- WILD, M. (1995). Pre-service Teacher Education Programmes for Information Technology: an effective education? Journal of Information Technology for Teacher Education, 4, 7-20.
- WILLERMAN, M. & MAC HARG, R. A. (1991). The concept map as an advance organizer. Journal of Research in Science Teaching, 28, 705-711.
- WILLIAMS, D., COLES, L., WILSON, K., RICHARDSON, A. & TUSON, J. (2000). Teachers and ICT: current use and future needs. British Journal of Educational Technology, 31, 307-320.
- WILLIAMS, W. M. & STERNBERG, R. J. (1988). Group intelligence: Why some groups are better than others. Intelligence, 12, 351-377.
- WINNANS, C. & BROWN, D. S. (1992). Some factors affecting elementary teachers' use of the computer. Computers in Education, 18, 301-309.
- WISE, A. (1997). Why education policies often fail: the hyper-rationalisation hypothesis. Curriculum Studies, 9, 43-57.
- WONG, K. (2008, January 30). School-based Technology Coordinators and Other Human Factors in the Implementation of ICT in Primary Schools: A Comparative Study. International Journal of Education and Development using ICT [Online], 4, 1. Available: <http://ijedict.dec.uwi.edu/viewarticle.php?id=368>
- WOODROW, J. (1991). A comparison of four computer attitude scales. Journal of Educational Computing Research, 7, 165-87.
- WOODS, P. (1981). Strategies, Commitment and Identity IN BARTON, L. & WALKER, S. (Eds). Schools, Teachers and Teaching. Lewes, UK: Falmer.
- WRIGHT, V. H., WILSON, E. K., GORDON, W. & STALLWORTH, J. B. (2002). Master technology teacher: A partnership between preservice and inservice teachers and teacher educators. Contemporary Issues in Technology and Teacher Education, 2, 353-362.
- YEUN, A. & MA, W. (2002). Gender difference in teacher computer acceptance. Journal of Technology and Teacher Education, 10, 365-382.
- YIN, R. (1994). Case study research: design and methods. California: SAGE Publications, Inc.

- YIN, Y., VANIDES, J., RUIZ-PRIMO, M., AYALA, C. & SHAVELSTON, R. (2005). Comparison of Two Concept-Mapping Techniques: Implications for scoring, interpretation and use. Journal of Research in Science Teaching, 42, 166-184.
- YOUNGMAN, M. & HARRISON, C. (1998). Multimedia portables for teachers pilot project report. Coventry: BECTA.
- ZACKS, J. & TVERSKY, B. (1997). Bars and lines: A study of graphic communication IN ANDERSON, M. (Ed). Reasoning with Diagrammatic Representations II. Menlo Park, CA, AAAI 1997 Fall Symposium.
- ZALTMAN, G., DUNCAN, R. & LEWIS, T. (1973). Innovations and Organisations. New York: John Wiley and Sons
- ZALTMAN, G. & DUNCAN, R. (1977). Strategies for planned change. New York: John Wiley and Sons.
- ZEILIK, M. (2005). Concept Maps .
Available : <http://www.flaguide.org/extra/download/cat/conmap/conmapw97.doc>
- ZHAO, Y., PUGH, K., SHELDON, S. & BYERS, J. (2002). Conditions for classroom technology innovations: Executive summary. Teachers College Record, 104, 482-515.
- ZIMMERMAN, D. & WEIDER, D. (1977). The diary: diary-interview method. Urban Life, 5, 479-98.

APPENDICES

Questionnaire and Mindmap task

Questionnaire results data

Completed Mindmaps

Personal viewpoints – T1,T2, T3

Pre- and Post classroom interviews questions

QUESTIONNAIRE AND MINDMAP TASK

Confidence and Teachers' ICT Usage in the Classroom

First of all, thank you for agreeing to take the time to participate in this research!

The case study is looking into teachers' confidence and competence in the use of IT and their effects on the use of this type of resource in the classroom.

The survey is in three parts. You can do Parts 1 and 2 all at once or over a few days. Part 3, an interview, will be later and will be designed to tease out more details shown by your answers to Parts 1 and 2.

Part 1

This questionnaire should take about 30 minutes altogether (if you fill in the Personal Viewpoint sections at the end as well!)

Part 2

In this section you are asked to draw a Mind Map – a drawing whose structure is decided by you and that allows free flow of ideas. This can take as long or as short a time as you want and, like the questionnaire, can be completed in one sitting or over a few days.

Please don't forget the last page!!!!

Again, thanks for your participation and I hope the wine helps to make the task a little easier!

Please return the booklet to me as soon as possible.

Timothy J Gray

Part 1

Questionnaire

Confidence and Teachers' ICT Usage in the Classroom

1 Name

2 School Environment

Please indicate your school's level of involvement in IT now

tick the description that closely matches your school

- ☐ limited activity schoolwide
☐ activity in some subjects
☐ very active in some subjects
☐ very active in most subjects

3 Ease of Implementation

How easy have you found it to make regular use of your computer?

tick the description that closely matches your experience

- ☐ I have had major problems which have persisted
☐ problems recurred but regular use has been possible
☐ early problems arose but these have been overcome
☐ few problems arose but computer use has not been continuous
☐ few problems were encountered and use has been continuous

4 Confidence & Competence

Please rate your current levels of confidence and competence

tick the description that closely matches your experience

	low				high
Confidence	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Competence	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	1	2	3	4	5

5 Usage Content

Please describe **your** use of the facilities listed here using the rating scale described below

- NONE** 1 no usage attempted
TRIED 2 attempted but unsuccessful
SOME 3 some successful use
OFTEN 4 regular successful use

circle the description that closely matches your experience

A Facilities	1 none	2 tried	3 some	4 often	B General software	1 none	2 tried	3 some	4 often
E-mail	1	2	3	4	Word processing	1	2	3	4
CD-ROM	1	2	3	4	Spreadsheet	1	2	3	4
Internet	1	2	3	4	Database	1	2	3	4
Fax	1	2	3	4	Printing or drawing	1	2	3	4
Scanner	1	2	3	4	Desktop publishing	1	2	3	4
Digital camera	1	2	3	4	Games or simulations	1	2	3	4
Datalogging equip	1	2	3	4	Personal organiser	1	2	3	4
Large screen monitor	1	2	3	4	Finance or accounts	1	2	3	4
Printing	1	2	3	4					

6 Internet Subscriptions

Please rate usage of your own
Internet subscriptions and any
Internet subscriptions the school
holds

- NONE** 1 no usage attempted
TRIED 2 attempted but unsuccessful
SOME 3 some successful use
OFTEN 4 regular successful use

School subscriptions

	none	tried	some	often
1 RM(Eduserve)	1	2	3	4
2 Freeserve	1	2	3	4

Your Subscriptions (please list)

	none	tried	some	often
3()	1	2	3	4
4()	1	2	3	4

circle the description that closely
matches your experience

Confidence and Teachers' ICT Usage in the Classroom

7 Software Usage

Please describe your main software use by rating all the programs listed below

The list is based on the programs that are currently being used at XXXXXXX Primary School.

NONE 1 no usage attempted
TRIED 2 attempted but unsuccessful
SOME 3 some successful use
OFTEN 4 regular successful use

circle the description that closely matches your experience

	none	tried	some	often		none	tried	some	often
Albert's house	1	2	3	4	Mission Control	1	2	3	4
All about number	1	2	3	4	My first dictionary	1	2	3	4
Ancient Egyptians	1	2	3	4	Number Shark	1	2	3	4
Art Gallery	1	2	3	4	Number Skills	1	2	3	4
Arthur's teacher trouble	1	2	3	4	Oxford Interactive	1	2	3	4
Children's Encyclopedia	1	2	3	4	Encyclopedia	1	2	3	4
Clicker Plus	1	2	3	4	Oz, the magical adventure	1	2	3	4
Counting and sorting	1	2	3	4	Past Lives British History	1	2	3	4
Crayola Magic Wardrobe	1	2	3	4	PB Bear's birthday party	1	2	3	4
Crystal Rainforest 2000	1	2	3	4	Practise Maths	1	2	3	4
Cyberworld	1	2	3	4	Practise Science	1	2	3	4
Encyclopedia -Science	1	2	3	4	Rhyme activities - activity	1	2	3	4
Encyclopedia - Nature	1	2	3	4	software	1	2	3	4
English for SATs 2	1	2	3	4	RM Our World	1	2	3	4
Exploring Castles	1	2	3	4	RM Window Box (eg Graph	1	2	3	4
Fuzzbuzz	1	2	3	4	maker, Roamer, etc)	1	2	3	4
Harry and haunted house	1	2	3	4	Romans	1	2	3	4
History of the World	1	2	3	4	SATs tests English KS1	1	2	3	4
How We Used to Live -	1	2	3	4	SATs tests Maths KS1	1	2	3	4
Early Victorians					Science for SATs 2	1	2	3	4
I Love Maths	1	2	3	4	Sound activities - literacy	1	2	3	4
I Love Science	1	2	3	4	Starspell 2001	1	2	3	4
I Love Spelling	1	2	3	4	Talking Clocks	1	2	3	4
Let's Go with Katy	1	2	3	4	Talking tables (7-9 years)	1	2	3	4
Mad About Maths	1	2	3	4	The Cat in the Hat	1	2	3	4
Magic School Bus	1	2	3	4	The Evacuees	1	2	3	4
Map Detective	1	2	3	4	The fish who could wish	1	2	3	4
Maths skills	1	2	3	4	The Lost Tribe	1	2	3	4
Max and haunted house	1	2	3	4	The New Way Things	1	2	3	4
Maximania	1	2	3	4	Work				
Microsoft WORD	1	2	3	4	The Romans - Zig Zag	1	2	3	4
Microsoft EXCEL	1	2	3	4	The Tortoise and the hare	1	2	3	4
Microsoft Publisher	1	2	3	4	Tizzy's toybox	1	2	3	4
Microsoft Powerpoint	1	2	3	4	Top of the class/ numbers	1	2	3	4
					Wellington Square	1	2	3	4
					Word puzzles (7-9 years)	1	2	3	4
					Word Shark	1	2	3	4

Confidence and Teachers' ICT Usage in the Classroom

8 Patterns of Usage

Please estimate your levels of usage of any computer equipment in the following areas

circle the description that closely matches your experience

NONE 1 no usage at all
SOME 2 occasional, as extra provision
HIGH 3 regular, an integral part of my work
MAJOR 4 heavy, I now depend on it

A collaboration

		none	some	high	major
1	with the other teachers in my school	1	2	3	4
2	with whole classes of pupils for teaching	1	2	3	4
3	with selected groups of pupils for teaching	1	2	3	4
4	with individual pupils for teaching	1	2	3	4
5	with groups of special needs pupils	1	2	3	4
6	with individual special needs pupils	1	2	3	4
7	with groups of colleagues for teaching	1	2	3	4
8	with individual colleagues for teaching	1	2	3	4
9	with colleagues for administration	1	2	3	4
10	by yourself in school for teaching purposes	1	2	3	4
11	by yourself in school for administration	1	2	3	4
12	by yourself at home for teaching purposes	1	2	3	4
13	by yourself at home for school administration	1	2	3	4
14	by yourself at home for personal tasks	1	2	3	4
15	by yourself at home for entertainment	1	2	3	4
16	by others at home for any use	1	2	3	4

B location

		none	some	high	major
17	in a fixed school location	1	2	3	4
18	in 2 or 3 school locations	1	2	3	4
19	in 4 or more school locations	1	2	3	4
20	in a meeting at school	1	2	3	4
21	in a meeting outside school	1	2	3	4
22	at home to continue work from school	1	2	3	4
23	at home for any purpose	1	2	3	4
24	in a location other than school or home	1	2	3	4

C integration

		none	some	high	major
25	to supplement existing teaching provision	1	2	3	4
26	to supplement existing administrative provision	1	2	3	4
27	to provide a new teaching resource	1	2	3	4
28	to provide a new administrative resource	1	2	3	4

Confidence and Teachers' ICT Usage in the Classroom

9 Internet usage

Please estimate your levels of involvement in the following Internet activities

circle the description that closely matches your experience

- NONE** 1 no usage at all
SOME 2 occasional, as extra provision
HIGH 3 regular, an integral part of my work
MAJOR 4 heavy, I now depend on it

		none	some	high	major
1	to access information for your own use	1	2	3	4
2	to access information for pupils' use	1	2	3	4
3	to demonstrate accessing information to pupil(s)	1	2	3	4
4	allowing pupils(s) to access information using your laptop	1	2	3	4
5	to access information for colleague(s)	1	2	3	4
6	to demonstrate accessing information to colleague(s)	1	2	3	4
7	allowing colleagues(s) to access information using your laptop	1	2	3	4
8	using e-mail for contact for teaching	1	2	3	4
9	using e-mail for contact for administration	1	2	3	4
10	using e-mail for contact for personal use	1	2	3	4
11	demonstrating e-mail to pupil(s)	1	2	3	4
12	demonstrating e-mail to colleague(s)	1	2	3	4
13	downloading information or images	1	2	3	4
14	downloading software	1	2	3	4

10 Support

Please indicate your view of the satisfactoriness of the support you have received in these areas

circle the description that closely matches your experience

- POOR** 1 generally minimal or unhelpful
FAIR 2 available but requiring much effort
GOOD 3 available and effective with little delay
EXCELLENT 4 extensive and rapidly effective

A aspects of usage

		poor	fair	good	excellent
1	guidance before receiving your laptop	1	2	3	4
2	guidance on continuing with the laptop	1	2	3	4
3	installation/set-up of laptop hardware	1	2	3	4
4	installation/set-up of laptop software	1	2	3	4
5	installation/set-up of non-laptop hardware	1	2	3	4
6	installation/set-up of non-laptop software	1	2	3	4
7	day to day usage of hardware	1	2	3	4
8	day to day usage of software	1	2	3	4
9	using CD-ROMS	1	2	3	4
10	using the Internet	1	2	3	4
11	telephone line access	1	2	3	4
12	printing	1	2	3	4

B sources of support

		poor	fair	good	excellent
13	RM familiarisation programme	1	2	3	4
14	World Wide Web sites	1	2	3	4
15	other colleague in your school	1	2	3	4
16	other colleague in another school	1	2	3	4
17	LEA advisory service	1	2	3	4
18	LEA ICT support service	1	2	3	4
19	someone in your family	1	2	3	4
20	a friend or acquaintance	1	2	3	4
21	hardware supplier(s)	1	2	3	4
22	software supplier(s)	1	2	3	4

Confidence and Teachers' ICT Usage in the Classroom

11 Personal perceptions

This section invites you to offer your views on a range of issues concerning IT.

circle the description that closely matches your experience

- 1 strongly agree
- 2 disagree
- 3 agree
- 4 strongly disagree
- ? unable to respond

		strongly agree	agree	disagree	strongly disagree	?
1	The laptop has allowed me to develop my teaching	1	2	3	4	?
2	I felt the money spent on IT was worthwhile	1	2	3	4	?
3	The impact on pupil learning of IT has been negligible	1	2	3	4	?
4	Most adults will benefit from the ability to use IT	1	2	3	4	?
5	I was reluctant initially to participate in IT training	1	2	3	4	?
6	Getting to know my laptop has taken up too much of my time	1	2	3	4	?
7	Certain groups of pupils have gained a lot from IT	1	2	3	4	?
8	IT imposes excessive demands on ordinary people	1	2	3	4	?
9	I feel I am in command of IT materials	1	2	3	4	?
10	The school as a whole has benefited from the introduction of IT	1	2	3	4	?
11	IT has enhanced our SEN provision	1	2	3	4	?
12	For most users the costs of IT exceed the benefits	1	2	3	4	?
13	The use of IT has interfered with other aspects of my work	1	2	3	4	?
14	My colleagues in school are sceptical about the use of IT in the school	1	2	3	4	?
15	Many pupils have been enthusiastic about the IT materials	1	2	3	4	?
16	Most people are unaware of the problems in producing effective IT	1	2	3	4	?
17	Having the laptop has increased my enthusiasm for IT	1	2	3	4	?
18	IT has assisted school management	1	2	3	4	?
19	Most of my pupils are not aware of the full use of IT in the school	1	2	3	4	?
20	Families without IT facilities will be disadvantaged	1	2	3	4	?
21	I would not have accepted the laptop if I had known what I know now	1	2	3	4	?
22	I have been able to help curriculum areas outside my own	1	2	3	4	?
23	Many pupils' interest in IT has been heightened	1	2	3	4	?
24	IT facilities are cheap enough for most families to afford	1	2	3	4	?
25	My use of IT has increased substantially	1	2	3	4	?
26	I have had problems integrating IT provision	1	2	3	4	?
27	I have improved my understanding of pupils' use of computers	1	2	3	4	?
28	IT has enabled schools to provide better services	1	2	3	4	?
29	I frequently worry about the risk of computer failure	1	2	3	4	?
30	I would not advise the school to spend its money in this way	1	2	3	4	?
31	It is difficult to introduce IT into the pupils' work	1	2	3	4	?
32	I enjoy introducing others to the use of computers	1	2	3	4	?
33	On balance the project's disadvantages outweigh any benefits	1	2	3	4	?
34	Pupils are often put off by computing in school	1	2	3	4	?
35	Children readily acquire a working understanding of IT	1	2	3	4	?
36	I resent devoting leisure time to IT-related tasks	1	2	3	4	?
37	I would like the school to develop multimedia laptop provision	1	2	3	4	?
38	Teachers need laptops to help them develop pupils' IT skills	1	2	3	4	?
39	Computer games are effective in developing IT skills	1	2	3	4	?

Confidence and Teachers' ICT Usage in the Classroom

12 Personal Viewpoint

This section invites you to offer your personal views on any issues related to IT. If you require extra space, please use the back of this sheet .

Of particular interest will be your responses to:

... what have been the most positive and negative outcomes of using IT for you

... how your use of computers and IT has changed

... any major problems you have encountered and how they were handled

... what recommendations you would make about introducing laptops for staff use into schools

... plans for future use of your laptops and software

... please feel free to comment on any aspect of IT you consider important

Part 2

Mind Map Task

Confidence and Teachers' ICT Usage in the Classroom

Mind maps are an easy way for people to jot down their thoughts on a subject without having to be concerned about sentence structure. By drawing your thoughts, they should be more spontaneous and using an open diagram such as a mind map allows you to add, take away or move things without affecting the sense of what you are trying to 'say'.

Mind maps are becoming more and more popular as their production does not rely on the restrictions associated with formal writing; and, more importantly, it allows your thoughts to jump around as your train of thought moves you back and forth through the concept.

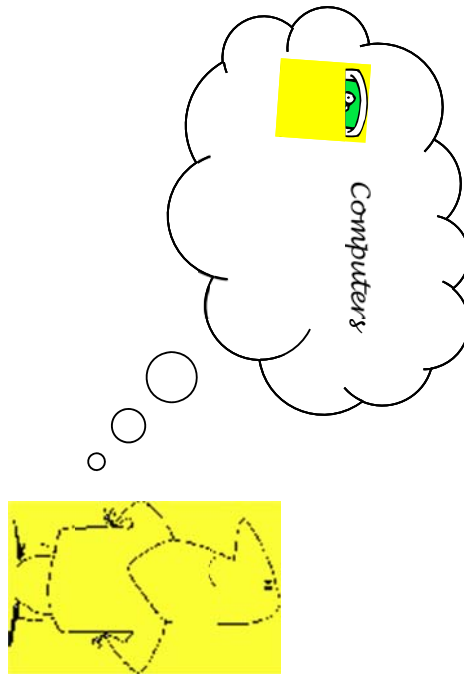
So, the order in which you draw things is not important. BUT, it is important to draw lines between the drawings you think are linked. Make the joins how you want them and don't worry if there are lots or only a few as that will depend upon your ideas.

Please do not take too long on this part of the survey. I suggest you use ordinary pencil rather than pen for the drawings but you may, if you like, use coloured pens/pencils to illustrate your map.

The title of you Mind Map is :

'Computers and Me'

Confidence and Teachers' ICT Usage in the Classroom



Confidence and Teachers' ICT Usage in the Classroom

**Finally, before you finish (sorry!) and to help in the analysis of your Mind Map,
Please spend five minutes writing a list of what you have drawn.
You do not need to draw in links, but you should keep ideas attached to individual drawings in the same part of the list.**

Thank you very much for taking the time to complete the survey!!

How to mind map!

Mind mapping is a friendly and fun way to show your thoughts on a project in place or can be used for planning a project from scratch

Start in the centre with a picture of the topic.

Use at least three colours (you may wish to use one particular colour for one theme - eg 'things I don't feel comfortable about')

Use images/pictures wherever possible (no, they don't have to be like a van Gogh!)

Words are put on branches, one word per branch

The images and words should sit on a line of the same length

Lines closer to the centre should be thicker ('cos they are supposed to show your main thoughts), while those further out are thinner (they show the equivalent of an 'afterthought' or secondary thought). Lines can move between any thought

You can use upper case, lower case or a mixture

You can emphasise a thought by surrounding it a with a star or any other border if you like.



QUESTIONNAIRE RESULTS DATA

QUESTIONNAIRE RESULTS SUMMARY

		TEACHER 1				TEACHER 2				TEACHER 3				TOTALS							
1 (Name)																					
2 School ICT Environment	1	limited activity schoolwide												0							
	2	activity in some subjects		1										1							
	3	very active in some subjects				1				1				2							
	4	very active in most subjects												0							
3 Ease of ICT implementation	1	I have had major problems which have persisted								1				1							
	2	problems recurred but regular use has been possible		1		1								2							
	3	early problems arose but these have been overcome												0							
	4	few problems arose but computer use has not been continuous												0							
	5	few problems were encountered and use has been continuous												0							
4 Confidence and competence			low		high	low		high		low		high		low		high					
	1	Confidence			1			1		1				1	0	2	0	0			
	2	Competence			1			1		1				1	0	2	0	0			
5 Usage contents - facilities			none	tried	some	often	none	tried	some	often	none	tried	some	often	none	tried	some	often			
	1	E-mail				1				1				1	0	0	2				
	2	CD-ROM				1				1		1		0	1	0	2				
	3	Internet				1				1				1	0	0	2				
	4	Fax			1				1					1	0	2	0				
	5	Scanner	1				1			1				3	0	0	0				
	6	Digital camera			1				1					1	0	2	0				
	7	Datalogging equip	1				1			1				3	0	0	0				
	8	Large screen monitor	1						1	1				2	0	0	1				
	9	Printing				1			1		1			0	1	0	2				
Usage content - application software	10	Word processing			1				1			1		0	0	2	1				
	11	Spreadsheet		1					1	1				1	1	0	1				
	12	Database		1					1		1			0	2	1	0				
	13	Printing or drawing			1				1		1			0	1	1	1				
	14	Desktop publishing	1						1		1			1	1	1	0				
	15	Games or simulations			1				1		1			0	1	2	0				
	16	Personal organiser	1					1		1				2	1	0	0				
	17	Finance or accounts	1				1			1				3	0	0	0				
6 Interent usage - school			none	tried	some	often	none	tried	some	often	none	tried	some	often	none	tried	some	often			
	1	RM(Eduserve)			1				1		1			1	0	2	0				
	2	Freereserve				1			1		1			1	0	1	1				
Internet usage - home	3	(own list)												0	0	0	0				
	4	(own list)												0	0	0	0				
7 Software usage		Genre	none	tried	some	often	none	tried	some	often	none	tried	some	often	none	tried	some	often			
	1	Art Gallery	A	1			1				1			3	0	0	0				
	2	Crayola Magic Wardrobe	A			1			1		1			1	0	2	0				
	3	Microsoft Publisher	APP		1					1				1	1	0	1				
	4	Microsoft EXCEL	APP	1						1				2	0	0	1				
	5	Microsoft Powerpoint	APP	1						1				2	0	0	1				
	6	Microsoft WORD	APP			1				1			1	0	0	2	1				
	7	RM Our World	APP			1				1				1	0	1	1				
	8	RM Window Box (eg Graph maker, Roamer, etc)	APP		1					1			1	0	1	1	1				
	9	The Lost Tribe	G	1			1			1				3	0	0	0				
	10	Ancient Egyptians	H	1			1						1	2	0	0	1				
	11	Exploring Castles	H			1	1			1				2	0	1	0				
	12	History of the World	H	1			1			1				3	0	0	0				
																		Genre			
																		Art (n=2)			
																		Application (n=6)			
																		Geography (n=1)			
																		History (n=8)			
																		Literacy (n=11)			
																		Maths (n=14)			
																		Problem Solving (n=16)			
																		REfERENCE (n=6)			
																		Science (n=2)			

QUESTIONNAIRE RESULTS SUMMARY

		TEACHER 1				TEACHER 2				TEACHER 3				TOTALS					
			none	some	high	major		none	some	high	major		none	some	high	major			
13	How We Used to Live - Early Victorians	H	1				1							1		2	0	1	0
14	Past Lives British History	H	1							1		1				2	0	0	1
15	Romans	H			1		1					1				2	0	1	0
16	The Evacuees	H	1				1					1				3	0	0	0
17	The Romans - Zig Zag	H			1		1					1				2	0	1	0
18	Clicker Plus	L	1				1					1		0		3	0	0	0
19	English for SATs 2	L	1				1					1				3	0	0	0
20	Fuzzbuzz	L				1	1					1				2	0	0	1
21	I Love Spelling	L	1				1					1		0		3	0	0	0
22	Rhyme activities - activity software	L	1				1					1				3	0	0	0
23	SATs tests English KS1	L	1				1					1				3	0	0	0
24	Science for SATs 2	L	1				1					1				3	0	0	0
25	Sound activities - literacy	L	1							1		1				2	0	0	1
26	Starspell 2001	L	1				1					1				3	0	0	0
27	Wellington Square	L				1	1					1				2	0	0	1
28	Word Shark	L				1	1					1				2	0	0	1
29	All about number	M	1						1			1				2	0	1	0
32	Arthur's teacher trouble	M	1						1			1				2	0	1	0
31	Counting and sorting	M	1				1					1				3	0	0	0
33	I Love Maths	M				1	1					1				2	0	0	1
30	Let's Go with Katy	M				1	1					1				2	0	0	1
34	Mad About Maths	M				1	1					1				2	0	0	1
35	Maths skills	M	1				1					1				3	0	0	0
36	Number Shark	M				1	1					1				2	0	0	1
37	Number Skills	M	1						1			1				2	0	1	0
38	Practise Maths	M				1				1		1				1	0	0	2
39	SATs tests Maths KS1	M	1				1					1				3	0	0	0
40	Talking Clocks	M	1				1					1				3	0	0	0
41	Talking tables (7-9 years)	M	1				1							1		2	0	1	0
42	Top of the class/ numbers	M	1				1					1				3	0	0	0
43	Albert's house	PS	1						1			1				2	0	1	0
44	Crystal Rainforest 2000	PS	1				1							1		2	0	1	0
45	Cyberworld	PS	1				1					1				3	0	0	0
46	Harry and haunted house	PS	1							1		1				2	0	0	1
47	Magic School Bus	PS				1	1					1				2	0	0	1
48	Map Detective	PS	1				1								1	2	0	0	1
49	Max and haunted house	PS	1							1		1				2	0	0	1
50	Maximania	PS	1						1			1				2	0	1	0
51	Mission Control	PS	1				1					1				3	0	0	0
52	Oz, the magical adventure	PS	1				1					1				3	0	0	0
53	PB Bear's birthday party	PS	1				1					1				3	0	0	0
54	The Cat in the Hat	PS				1					1	1				1	0	0	2
55	The fish who could wish	PS	1							1		1				2	0	0	1
56	The Tortoise and the hare	PS	1				1					1				3	0	0	0
57	Tizzy's toybox	PS	1							1		1				2	0	0	1
58	Word puzzles (7-9 years)	PS	1				1					1				3	0	0	0
59	Children's Encyclopedia	REF			1				1			1				1	2	0	0
60	Encyclopedia -Science	REF	1				1					1				3	0	0	0
61	Encyclopedia - Nature	REF	1				1					1				3	0	0	0
62	My first dictionary	REF	1						1			1				2	0	1	0
63	Oxford Interactive Encyclopedia	REF			1		1					1				2	1	0	0
64	The New Way Things Work	REF	1				1					1				3	0	0	0
65	I Love Science	S				1	1							1		1	0	1	1
66	Practise Science	S	1				1					1				3	0	0	0
			none	some	high	major	none	some	high	major	none	some	high	major	none	some	high	major	
1	with the other teachers in my school	T			1				1				1			0	3	0	0
2	with whole classes of pupils for teaching	P	1						1			1				2	1	0	0
3	with selected groups of pupils for teaching	P				1			1			1				1	1	1	0

8 Patterns of use - collaboration

QUESTIONNAIRE RESULTS SUMMARY

		TEACHER 1				TEACHER 2				TEACHER 3				TOTALS					
Patterns of use - location	4 with individual pupils for teaching	P		1			1			1				0	1	2	0		
	5 with groups of special needs pupils	P		1			1			1				1	2	0	0		
	6 with individual special needs pupils	P		1			1			1				1	2	0	0		
	7 with groups of colleagues for teaching	T	1				1			1				2	1	0	0		
	8 with individual colleagues for teaching	T	1				1			1				2	1	0	0		
	9 with colleagues for administration	T		1			1			1				1	2	0	0		
	10 by yourself in school for teaching purposes	S	1					1		1				1	1	0	1		
	11 by yourself in school for administration	S		1				1		1				1	1	0	1		
	12 by yourself at home for teaching purposes	S		1				1		1				1	1	0	1		
	13 by yourself at home for school administration	S		1				1		1				1	1	0	1		
	14 by yourself at home for personal tasks	S			1			1		1				1	0	1	1		
	15 by yourself at home for entertainment	S			1		1			1				1	1	1	0		
	16 by others at home for any use	O	1				1			1				2	0	1	0		
	17 in a fixed school location	L			1			1		1				0	1	1	1		
	Patterns of use - integration	18 in 2 or 3 school locations	W		1			1	1		1				0	3	1	0	
19 in 4 or more school locations		W	1				1			1				2	1	0	0		
20 in a meeting at school		L	1				1			1				2	1	0	0		
21 in a meeting outside school		W	1					1		1				1	1	1	0		
22 at home to continue work from school		H		1				1		1				1	1	1	0		
23 at home for any purpose		H			1		1			1				2	0	1	0		
24 in a location other than school or home		W	1				1			1				1	2	0	0		
25 to supplement existing teaching provision		C		1			1			1				0	3	0	0		
26 to supplement existing administrative provision		A		1			1			1				1	2	0	0		
27 to provide a new teaching resource		C		1			1			1				0	3	0	0		
28 to provide a new administrative resource		A		1			1			1				1	2	0	0		
			none	some	high	major	none	some	high	major	none	some	high	major	none	some	high	major	
9 Internet usage		1 to access information for your own use					1		1			1				1	1	0	1
2 to access information for pupils' use			1				1			1				1	2	0	0		
3 to demonstrate accessing information to pupil(s)			1				1			1				1	2	0	0		
4 allowing pupils(s) to access information using your laptop		1				1				1				3	0	0	0		
5 to access information for colleague(s)			1				1			1				1	2	0	0		
6 to demonstrate accessing information to colleague(s)		1					1			1				2	1	0	0		
7 allowing colleagues(s) to access information using your laptop		1					1			1				2	1	0	0		
8 using e-mail for contact for teaching		1					1			1				2	1	0	0		
9 using e-mail for contact for administration		1					1			1				2	1	0	0		
10 using e-mail for contact for personal use				1			1			1	1			1	1	1	0		
11 demonstrating e-mail to pupil(s)			1			1				1				2	1	0	0		
12 demonstrating e-mail to colleague(s)		1				1				1				3	0	0	0		
13 downloading information or images			1			1				1				2	1	0	0		
14 downloading software		1				1				1				3	0	0	0		
			poor	fair	good	excellent	N/A	poor	fair	good	excellent	poor	fair	good	excellent	poor	fair	good	excellent
10 Support - aspects of usage	1 guidance before receiving your laptop				1					1				1		0	0	3	0
2 guidance on continuing with the laptop				1						1				1		0	0	3	0
3 installation/set-up of laptop hardware				1						1				1		1	0	2	0
4 installation/set-up of laptop software				1						1				1		1	0	2	0
5 installation/set-up of non-laptop hardware				1					1					1		1	1	1	0
6 installation/set-up of non-laptop software				1					1					1		1	1	1	0
7 day to day usage of hardware				1						1				1		1	0	2	0
8 day to day usage of software				1						1				1		1	0	2	0
9 using CD-ROMS				1						1				1		1	0	2	0
10 using the Internet				1						1				1		1	0	2	0
11 telephone line access				1					1					1		1	1	1	0
12 printing				1						1				1		1	0	2	0
Support - sources of support	13 RM familiarisation programme			1						1				1		1	0	2	0
	14 World Wide Web sites					1				1				1		1	0	1	0

QUESTIONNAIRE RESULTS SUMMARY

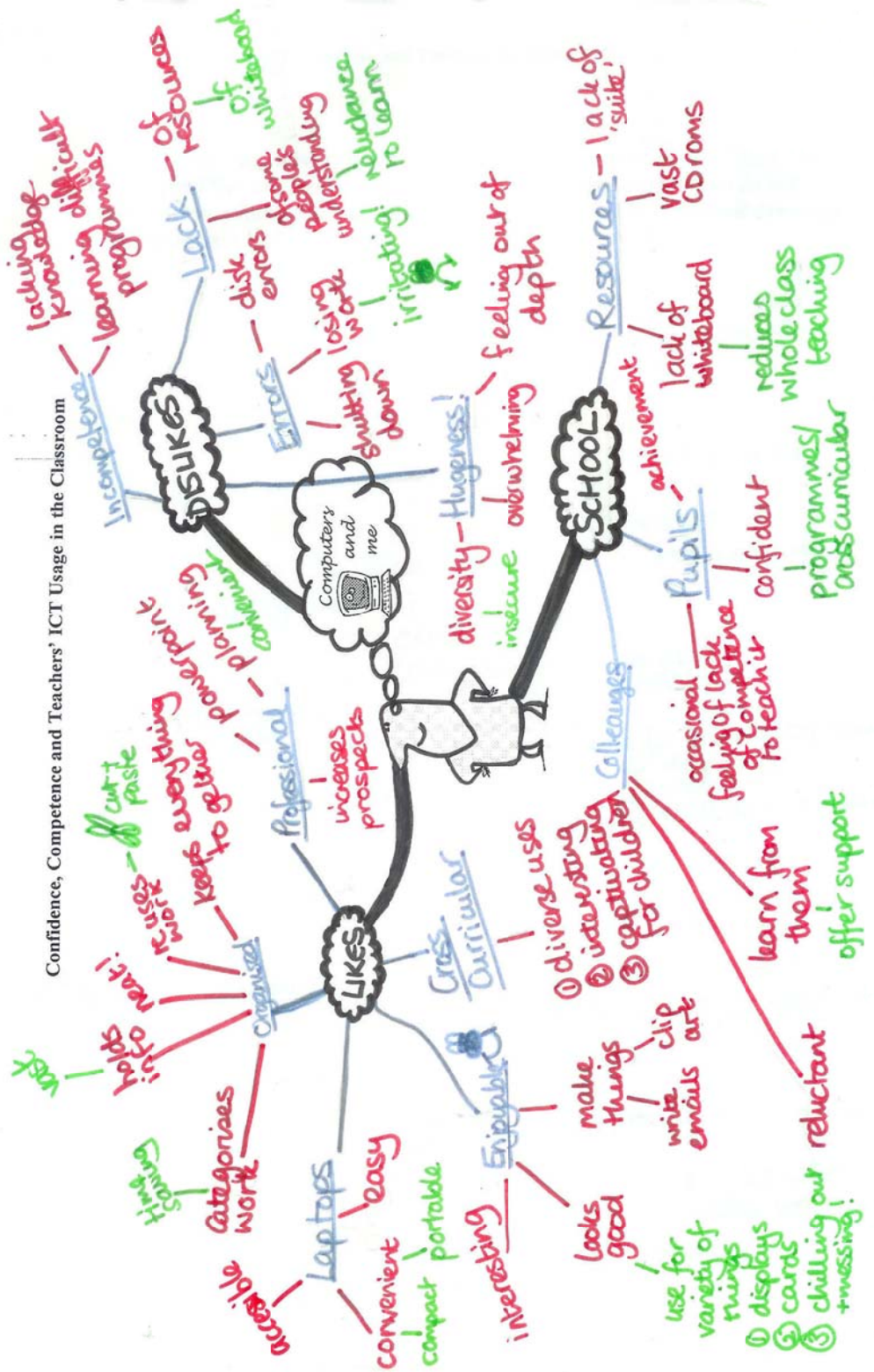
		TEACHER 1					TEACHER 2					TEACHER 3					TOTALS				
15	other colleague in your school			1				1				1					1	0	2	0	0
16	other colleague in another school					1		1				1					0	1	1	1	0
17	LEA advisory service					1		1				1					1	1	0	0	0
18	LEA ICT support service		1					1				1					1	2	0	0	0
19	someone in your family					1			1			1					1	0	1	0	0
20	a friend or acquaintance					1		1				1					1	1	0	0	0
21	hardware supplier(s)					1	1					1					2	0	0	0	0
22	software supplier(s)					1	1					1					2	0	0	0	0

11 Personal perceptions

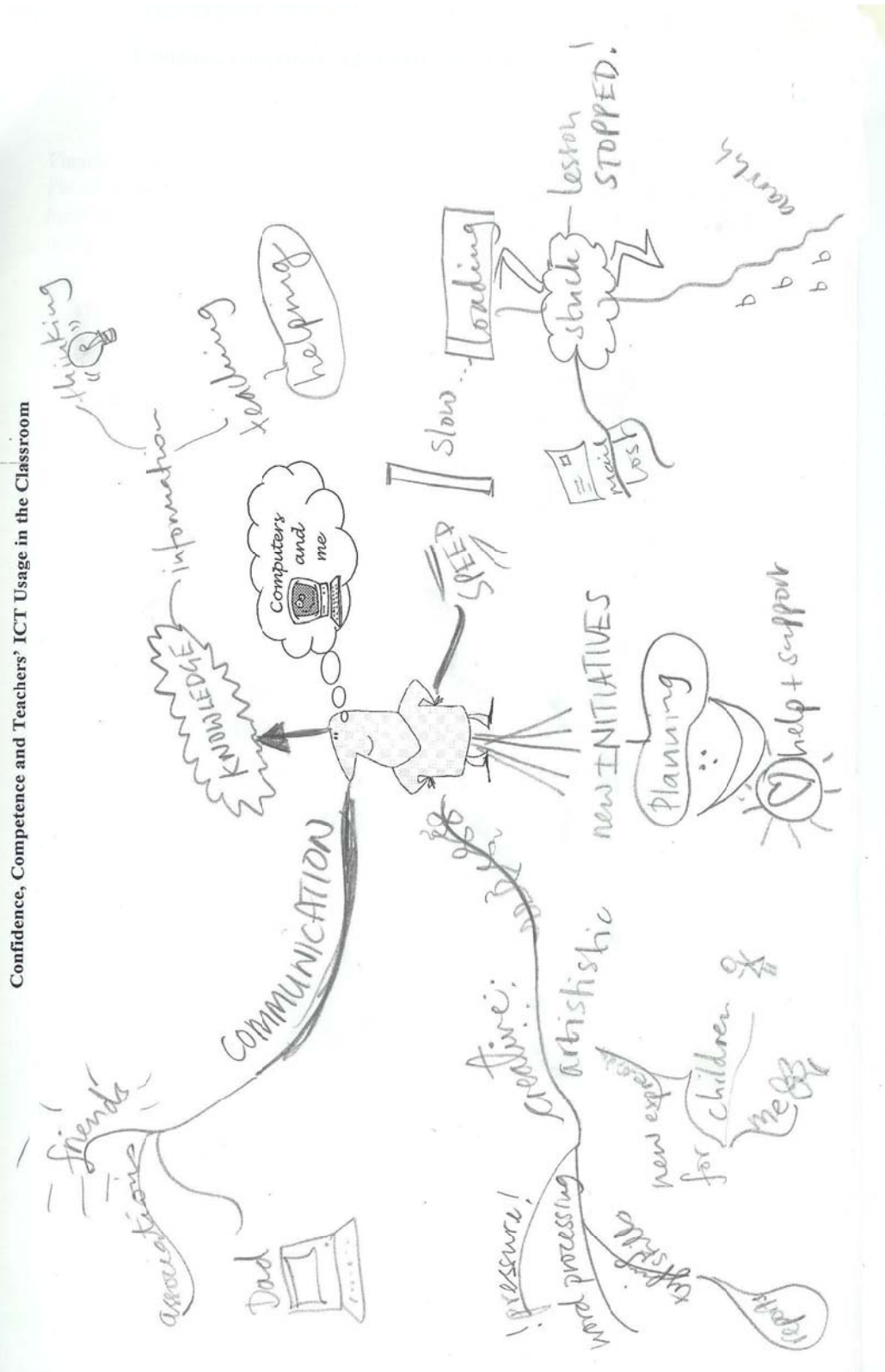
T+ teacher positive outcome
T- teacher negative outcome
S effects on school
O effects on others
L effects on pupils' learning

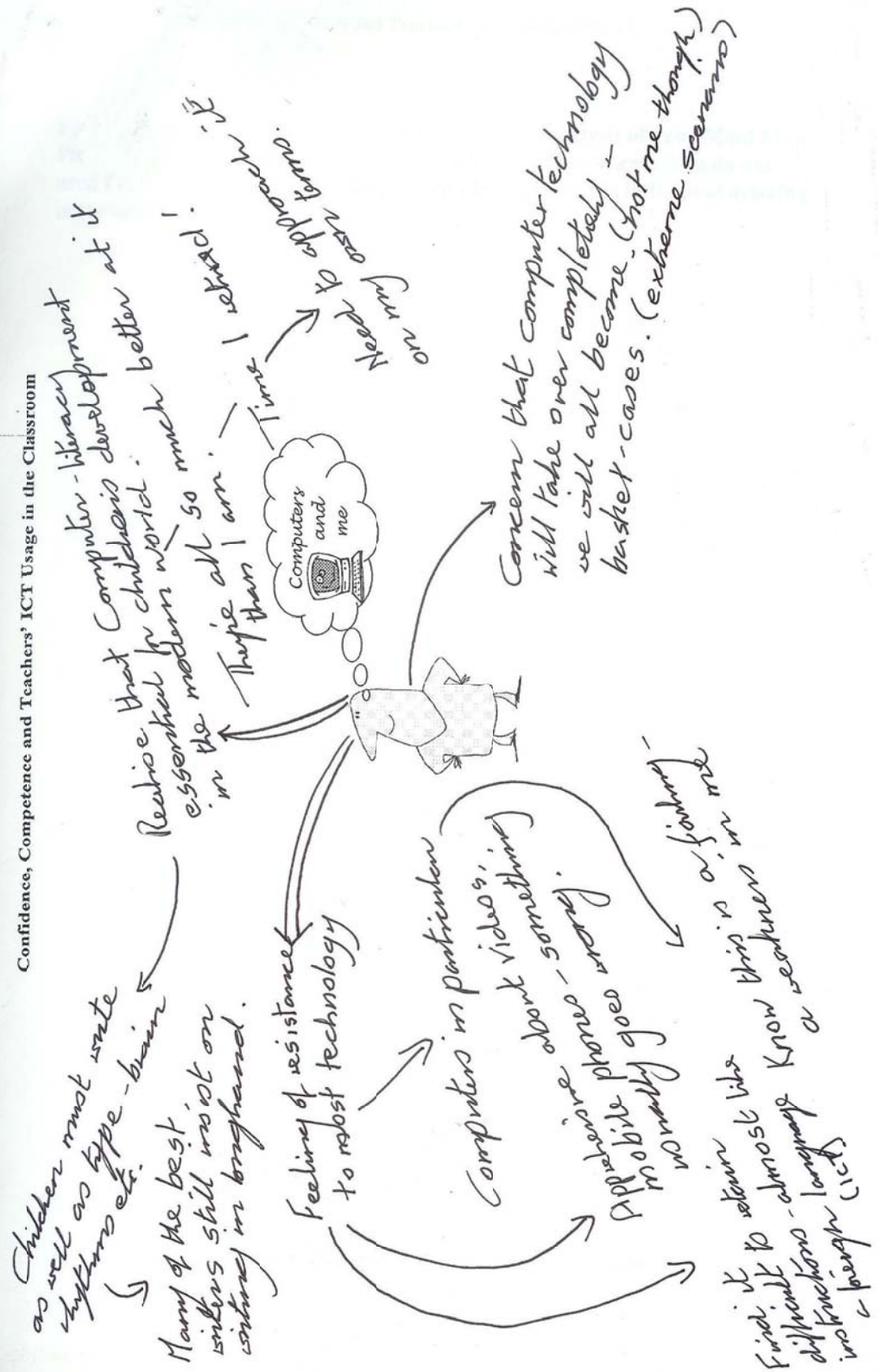
		Attitude designator																			
		strongly disagree	disagree	agree	strongly agree	not sure	strongly disagree	disagree	agree	strongly agree	not sure	strongly disagree	disagree	agree	strongly agree	not sure	strongly disagree	disagree	agree	strongly agree	not sure
1	Teachers need laptops to help them develop pupils' IT skills	T+	1				1					1				1	0	2	0	0	1
6	The laptop has allowed me to develop my teaching	T+	1				1					1				1	0	2	1	0	0
13	I was reluctant initially to participate in IT training	T+		1					1			1					1	0	1	1	0
14	I feel I am in command of IT materials	T+	1				1					1			1		0	2	0	1	0
16	Having the laptop has increased my enthusiasm for IT	T+	1				1					1			1		1	1	1	0	0
21	I have been able to help curriculum areas outside my own	T+		1						1		1			1		0	0	2	0	1
26	Many pupils' interest in IT has been heightened	T+	1				1					1			1		0	3	0	0	0
29	My use of IT has increased substantially	T+	1					1				1			1		0	1	2	0	0
30	I have improved my understanding of pupils' use of computers	T+	1						1			1			1		0	1	1	0	1
31	I enjoy introducing others to the use of computers	T+	1							1		1			1		0	1	1	0	1
36	On balance the project's disadvantages outweigh any benefits	T+	1					1				1			1		0	1	2	0	0
5	Getting to know my laptop has taken up too much of my time	T-		1						1		1			1		0	1	1	1	0
9	The use of IT has interfered with other aspects of my work	T-	1					1				1			1		0	1	2	0	0
17	My colleagues in school are sceptical about the use of IT in the school	T-		1					1					1			0	0	3	0	0
22	Most people are unaware of the problems in producing effective IT	T-	1				1					1					1	2	0	0	0
23	I would not have accepted the laptop if I had known what I know now	T-		1					1		1	1					1	0	1	1	0
25	I have had problems integrating IT provision	T-	1					1			1						1	1	1	0	0
27	I frequently worry about the risk of computer failure	T-	1					1				1			1		0	1	2	0	0
32	I would not advise the school to spend its money in this way	T-		1				1							1		0	0	2	0	1
33	It is difficult to introduce IT into the pupils' work	T-	1					1					1				1	0	2	0	0
38	I resent devoting leisure time to IT-related tasks	T-		1				1				1			1		0	1	2	0	0
2	I felt the money spent on IT was worthwhile	S+	1				1					1			1		0	3	0	0	0
10	The school as a whole has benefited from the introduction of IT	S+	1				1					1			1		0	3	0	0	0
11	IT has enhanced our SEN provision	S+	1				1					1			1		1	2	0	0	0
18	IT has assisted school management	S+	1				1					1			1		0	3	0	0	0
37	I would like the school to develop multimedia laptop provision	S+	1				1								1		0	2	0	0	1
4	Most adults will benefit from the ability to use IT	O+	1				1					1			1		0	3	0	0	0
24	IT facilities are cheap enough for most families to afford	O+		1				1					1		1		0	0	3	0	0
28	IT has enabled businesses to provide better services	O+	1				1						1		1		0	2	1	0	0
8	IT imposes excessive demands on ordinary people	O-		1					1			1			1		0	1	1	1	0
12	For most users the costs of IT exceed the benefits	O-	1					1				1			1		0	1	2	0	0
20	Families without IT facilities will be disadvantaged	O-		1				1				1			1		0	1	2	0	0
7	Certain groups of pupils have gained a lot from IT	L+	1				1					1			1		0	3	0	0	0
15	Many pupils have been enthusiastic about the IT materials	L+	1				1				1				1		1	2	0	0	0
35	Children readily acquire a working understanding of IT	L+	1				1					1			1		0	3	0	0	0
39	Computer games are effective in developing IT skills	L+	1				1					1			1		0	3	0	0	0
3	The impact on pupil learning of IT has been negligible	L-		1				1				1			1		1	0	2	0	0
19	Most of my pupils are not aware of the full use of IT in the school	L-	1					1					1		1		0	1	2	0	0
34	Pupils are often put off by computing in school	L-		1				1						1			0	0	2	1	0

COMPLETED MINDMAPS



T2 Completed Mindmap





12 Personal Viewpoint - T1 (Y3/4 teacher)

This section invites you to offer your personal views on any issues related to IT. If you require extra space, please use the back of this sheet .

Of particular interest will be your responses to:

... what have been the most positive and negative outcomes of using IT for you

The huge bank of knowledge I have discovered on the internet is great.

Failure of hardware and software causing time-wasting and frustration.

... how your use of computers and IT has changed

I am more competent and more enthusiastic around computers generally

...any major problems you have encountered and how they were handled

In class, not being able to remedy faults for children instantly.

Keyboard or laptop breaking after forming email connections with friends

... what recommendations you would make about introducing laptops for staff use into schools

That personal use should be encouraged (with or without financial support).

An awareness that, for some teachers, computers will never be of interest!

... plans for future use of your laptops and software

More confident use for admin, writing reports and headings and posters

... please feel free to comment on any aspect of IT you consider important

Although competence and confidence are both linked to giving teachers laptops, clearer guidelines on how to incorporate ICT meaningfully in particular curriculum areas is needed.

I would still have preferred a specialist IT teacher teaching my class and will give my classroom assistant responsibility for much of my IT syllabus as I don't feel that I can spare the time during lesson times to help the pupils sufficiently.

12 Personal Viewpoint - T2 (Reception and Year 1 teacher)

This section invites you to offer your personal views on any issues related to IT. If you require extra space, please use the back of this sheet .

Of particular interest will be your responses to:

... what have been the most positive and negative outcomes of using IT for you

Positive: I feel that I spend less time planning due to work on the computer - everything is planned on the computer/saved/resused.

Negative: I do worry that I don't do enough with the children regarding IT.

... how your use of computers and IT has changed

Over the past six years I have used computers more in all areas.

I now make worksheets, display titles, etc.

I thoroughly enjoy interactive whiteboards and have found this really enhancing my teaching.

...any major problems you have encountered and how they were handled

Frustration when it seems that a seemingly obvious task for the computer doesn't happen!

The computer says "error" but you don't know what! Eg not printing or not loading something or refusing to shut down.

... what recommendations you would make about introducing laptops for staff use into schools

I felt quite confident using them but others may need more training to introduce how they work and how to use them.

... plans for future use of your laptops and software

I plan to investigate more into the internet using the laptop.

Also more work on PowerPoint for meetings.

... please feel free to comment on any aspect of IT you consider important

I find the educational programmes, especially numeracy/literacy teach as many skills in their own area as they do ICT skills. My children are very confident with these.

12 Personal Viewpoint - T3 (Years 4, 5 and 6 teacher)

This section invites you to offer your personal views on any issues related to IT. If you require extra space, please use the back of this sheet.

Of particular interest will be your responses to:

... what have been the most positive and negative outcomes of using IT for you

... how your use of computers and IT has changed

... any major problems you have encountered and how they were handled

... what recommendations you would make about introducing laptops for staff use into schools

... plans for future use of your laptops and software

... please feel free to comment on any aspect of IT you consider important

(This teacher opted for a general comment, not specifically linking to the suggested heading)

The growing impact of ICT in schools has left me teaching in its wake.

While I fully agree that children should be confident in a technology which so much broadens their horizons and will be so much a part of their future, I have found it difficult, partially because of feelings of inadequacy on my part, to use it routinely as part of my teaching.

I enjoy manually cutting and pasting my own pictures to make worksheets more interesting – why would I want to spend time scanning and electronically cutting and pasting – my way is easier and more reliable.

Children learn interactively and pleasurably by using ICT and it is of great use in lightening the administrative load, but I have reservations about the extent of its use in school today.

Something new is always coming along and I'll never be able to learn it all, so I don't see any point in trying.

Pre- and Post- classroom interviews

Pre

What have you decided to do?

Why is this important to you? (personal? curriculum?)

What ICT are you planning on using?

What learning do you expect to take place?

What are you expecting to achieve?

Post

What happened?

What learning did you think took place?

Did you use the technology as planned?

Where there any problems during the lesson?

What areas would you change?

Do you think you would have attempted this kind of lesson two years ago/How do you feel about ICT now?

How has your ICT skills developed over the last two years?

Why do think this is?

Yours

What ICT did they use?

How was it used?

Did they seem comfortable with the technology?

Is there a perception that their confidence has increased?

What factors have affected this?

What learning went on?

R- Researcher T1- Teacher 1

Recorded unit	Central theme
1. R: Okay, what are you going to do?	
2. T1:Two ICT activities, one is a cyber hunt type activity with an open ended task where 2 groups of children have got to make a presentation with a title Water Is Important. They have to decide where on the Internet they're going to research it after giving them some initial pointers, so they have to choose sort of chapter headings for it, they have to decide what software package to present it and how to present it and it had to inform the rest of the class so that gives it audience and purpose.	2. Children on line researching
3. The other activity is more of a literacy one, partly constrained by the fact that the internet access for the laptops isn't great in the classroom,	3. Problems with accessing internet for all the laptops.
4. so the others are working off line and they've got to do a piece of persuasive writing on why we should have a world Children's Day in this country. That's after having found out about Children's Day in Japan.	4. Cross curricular links
5. R: So, why is this particularly important to you? Is it personal, is it curriculum?	
6. T1:They're both because the geography topic is one that I've come up with personally, our amazing world things and we're looking at all different aspects of geography around the world, but its also been guided by the stuff that	
7. the children have responded to best so an open ended internet research task is one of their favorite things because it is variable independently and it's not as prescriptive.	7. Open ended approach using the internet.
8. R: Great, thank you. What IT are you using?	
9. T1:Laptops, desktops, Internet access, the presentation package of some sort and a word processing package.	9. Using laptops, internet and applications package.
10. R: What learning do you expect to take place?	
11. T1:On the geography side using a range of media resources to research and independent research largely, trying to get them to ask questions and then find the right answers to them independently, but also there's a literacy link because some of the others are doing persuasive writing and using the word processor to allow them to edit it and do it	11. Children's independent researching

<p>efficiently.</p> <p>12. R: The last question is what do you expect to achieve out of this?</p> <p>13. T1:I am looking for the research groups to as I said have come up with meaningful geographic questions and use the IT as a means to answer them, specifically Internet in this particular case.</p> <p>14. With the others I'm looking for them to apply their understanding of the subject in a different context, so turning it into their own persuasive piece of writing based on what they've learned about something else.</p> <p>15. R: Good, thank you.</p>	<p>13. Self motivating children, own internet research.</p> <p>14 Children applying what they have learned to feedback to others</p>
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R- Researcher T1- Teacher 1

Recorded unit	Central theme
1. R: So what learning took place there?	
2. T1: The two research groups, I don't think you become a proficient user of the internet or somebody who is able to get what they want from the internet without practice so by giving them a focus and asking them to use it in quite a wide way and then narrow it down and find it,	2. Focused web-based learning activity.
3. I think is a great way in finding their research skills.	3. Developing children's research skills.
4. R: Okay, fine, were there any problems with the technology, generally, within the lesson?	
5. T1: No. Everything worked that we had. I would have liked to have had Internet access in the classroom for everybody, but in the end didn't have.	5. No class-wide access to internet.
6. [child's name] had not correctly saved his file on his story but the good thing about that is you're able to recreate it very, very quickly so they're back to where they were and I sorted that out for them, so that's fine. I was able to handle that for them.	6. Some problems with children saving/loading.
7. R: What areas would you change?	
8. T1: In terms of?	
9. R: Anything in the way you did it, to use technology, whether or not to use Power Point again?	
10. T1: There's always things you can change, I mean nothing is ever perfect and sometimes you try – but this is the beginning of the interactive white board use and we were really doing a brief reminder of the past two weeks. That didn't need to be, that's just this is what we've been doing.	10. Newly introduced interactive whiteboards and still learning.
11. R: I like the use of the hyperlinks on the word documents.	
12. T1: We're trying to be a bit more environmentally conscious and not print off so much stuff, so sometimes sending them to places through a hyperlink is better.	12. Use of advanced ICT techniques.
13. R: Okay, now the basis of all of this is to work out the difference between what we were like 2 years ago and what we're like now. So, do you think you would have attempted this lesson 2 years ago?	

14. T1: We didn't have the broadband Internet links in the classroom	14. Increase in internet infrastructure
15. and we only had one mobile interactive white board, so in terms of those developments, no, it wouldn't have been possible.	15. Introduction of new hardware - interactive whiteboards.
16. R: How about your confidence in using the equipment?	
17. T1: Well, I came to teaching already as an ICT specialist so in terms of my sort of willingness to use the stuff, I think it hasn't kind of increased, I think that wasn't a big thing I've had to improve.	17. Teacher previous experience in ICT.
18. What I have tried to do is make ICT much more cross curricular which is why it was in a geography lesson, which is why there was literature going on as well. Part of that sort of whole school cross curricular ICT rather than just ICT skills.	18. ICT across the curriculum.
19. R: Is there something about how you use ICT now as opposed to the status of how you used it a few years ago?	
20. T1: I think having the wireless links, having the broadband linked to the laptops, the broadband link to an interactive white board is invaluable and that gets used in probably 90% of what I do.	20. Using internet as major part of ICT work.
21. R: So it has improved in terms of the use of the internet with broadband and the new interactive whiteboards?	
22. T1: Particularly with white boards and laptops.	22. Whiteboards and laptops have improved accessibility.
23. R: How do you think your skills have changed over the last 2 years, if so, how, and what's caused them to change? Is any aspect in terms of change?	
24. T1: I think in terms of because my skills from outside was with business data handling so what I have started to do much more is use communications software and presentation practice, the Easy Teach stuff, I use that a lot and so making it much more interactive so it's not me standing there working, it's the children with their hands on the computers and using the skills.	24. Interactive with children.
25. R: So when do you do your preparation for this?	
26. T1: I do my preparation outside of school at home, mostly.	26. Planning done at home, but (28)...
27. R: What makes it easier to do it outside of home?	

<p>28. T1: OH, having the laptop. Having my new laptop, which I've got wireless broadband at home. Before with my old one I was tied to a cable by the telephone point because it was an old Dell laptop.</p> <p>29. R: [T3] said that as well, so having a laptop at home has helped you as well, but it's not so much just the laptop, it's the connection with the broadband?</p> <p>30. T1: Absolutely because I believe very strongly that the Internet is an incredibly valuable research tool. It has loads there providing you're capable of using it with some discernment,</p> <p>31. which is something I've been able to do and that's what I want the children to be able to do, but that's the way I do a lot of my work at home and it's much, much easier for me to do my work at home now and do it.</p> <p>32. R: The research has shown two years ago that it was the laptop was having an effect, now it is using broadband. Are there any areas ICT could provide you think needs improving?</p> <p>33. T1: I would like to have more reliable things like really good children's encyclopedias on CD Rom. I'm not that impressed with the ones that we've got, the DK, because the biggest issue I see is resource, the different topics, it would be nice to know that we have a really sparkly online encyclopedia with the lack of internet access in the classroom, because then you're much more able to direct.</p> <p>34. R: The hard CD based?</p> <p>35. T1: Or something that would provide an equivalent function. The Deakin Multimedia Encyclopedia is nice, but it's very limited in some areas, I think there are others.</p> <p>36. R: (inaudible)</p> <p>37. T1: No, they don't, and it doesn't work with the operating system we have so yeah, I think having research tools that are loaded that you can use off line for the kids to use is great.</p> <p>38. R: That's it, thank you. Well done.</p>	<p>28. Using laptops at home has improved planning time.</p> <p>30. Internet as a large resource .</p> <p>31. Children see it as this and know how to access it.</p> <p>33. Still prefers loaded programmes such as encyclopaedias</p> <p>37. Problem with software compatibility</p>
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R- Researcher T2- Teacher 2

Recorded unit	Central theme
1. R: What did you decide to do?	2. Web-based learning
2. T2: We're doing some research so we're going to do some cyber hunts.	
3. R: So, why is this important to you, is it a personal reason?	
4. T2: Well, because it's a good science thing to do with it, the last few weeks of term involves our research that we're doing in English and topic at the moment and it's a way of infusing research to them really in a fun way.	4. Cross-curricular use of ICT.
5. R: Good, thank you. What ICT are you using?	6. Use of Interactive whiteboard and laptops for learning.
6. T2: The interactive white board just to show everybody what we're doing and give everybody a sense to try it and then we're going to work on the laptops to sort of take it to a different level.	
7. R: Okay, what learning are you expecting to take place?	8. Using other skills
8. T2: Well, there's two levels really, one is using questions, specific questions and so using scanning and skimming a page for information to find an answer to a specific question is what they're going to need to be able to do and	
9. also to then use some of these websites again in their own research independently so we're going to hopefully look up some stuff about weather, some useful sites and they'll use it in their research and when they're on their own.	
10. R: Okay, and the last point is what's expected to be achieved by all of this on a personal level as well as on a teaching level?	9. Promoting independent student research.
11. T2: Well, on a personal level I've not done this before, I've not done cyber hunts with the children so we'll see how it goes and how useful it is and the children, well the children get research skills from the Internet which is a sort of research they have to do as well as doing research in books.	
12. R: Okay, thank you. That's it.	11. New use of ICT by teacher.

R- Researcher T2- Teacher 2

Recorded unit	Central theme
1. R: Okay, right. What's happened during the lesson?	2. Internet use by children - some good, others needed support.
2. T2: Oh, I think it was fine. I think when children get back to their own activity - because the work was website based – some of them needed a lot of help just finding their way on the internet and others are on the internet all the time and it's not a problem for them. Some of them just need support.	
3. R: Do you think the learning that you wanted took place?	
4. T2: I think so; I think you could do a long assessment on it. But I think yes, some of their answers are going to need a bit more about recording and then what websites could we then go on to use again, what could we use first and then what are we not interested in.	4. Assessment/Next steps
5. R: Okay, good. Thank you. Did the technology used go as planned?	6. Quite positive on hardware
6. T2: Yes, pretty much on this occasion!	
7. R: Have you had problem before?	
8. T2: Yes, some of the laptops don't work, sometimes the internet doesn't work on them, sometimes the laptops haven't been recharged ... you have to check they are recharged and plug them in, but no, on the whole it was okay. It was fine.	8. Problems with hardware
9. R: So, are there areas you would change regarding technology use?	10. Still positive re technology use
10. T2: No, I don't think so.	
11. R: Do you think you would have done this two years ago?	
12. T2: No.	12. Increase in ICT use.
13. R: Okay, why?	

14. T2: Well, I didn't know what cyber hunts were two years ago and I didn't have an interactive white board so anything I was teaching in the way of ICT was done on the PC which was always difficult to manage when you've got 20 odd children needing to see it.	14. Increase in knowledge of websites
15. But the fact that you can do it on the interactive whiteboard and you can check and when you can show them step by step together it makes a big difference.	15. Advantages in new hardware
16. Also being confident to use that particular program, finding a program outside of this site, the Tony Poulter site.	16. Confidence in programme use.
17. I didn't even know that websites like that were even available - that's a teaching tool site, but it also has children's stuff on it so that was actually recommended by staff.	17. Unaware of types of sites available on web.
18. R: That leads to other sites as well.	
19. T2: Yes, there is a huge amount of stuff you can use there. Now actually [child's name] will go on that site alone that are (inaudible) the book they are interested in.	19. Children's ICT confidence on web improved.
20. R: Yeah.	
21. T2: They actually like that particular site and I can leave them on it happily.	21. Good web sites.
22. R: Do you think that your ICT teaching skills have increased over the last two years and why?	
23. T2: Usually, but I have my own laptop at school that I use at home,	23. Use of school laptop at home.
24. being 'forced' (humour) by my head teacher to do forms and write reports	24. Directed by HT to use ICT for admin.
25. but seeing the advantages of it, of doing things, and then of course with	25. Advantages of using ICT for admin.
26. the children, seeing how they love it and how motivated they are and how quick they are really with it.	26. Children motivated.
27. I enjoy it more now and I'm more confident to use things that are relevant rather than just finding doing a general search which I might have done two years ago, but I don't think it would have been as useful.	27. Teacher enjoys ICT more

28. R: So one of the big factors has been having your own laptop?	
29. T2: Yeah, having my own laptop, having the interactive white boards as well, but obviously I am only just starting with that, but having it there to use in your own time and your own space just means you tend to fiddle around with it to get confident by trying it a little bit (inaudible) the whole unit, just using it a bit and the little starts or looking at an interactive map or something in topic, doing it bit by bit helps.	29. Introduction of Interactive whiteboards - still learning.
30. R: So you use it for starts in other lessons?	
31. T2: Yes, I use it in other lessons quite a lot at the moment, more actually then in ICT.	31. Use ICT in other curriculum areas.
32. R: So is there anything else you think has affected the way you've actually done, you've used ICT over the years, that with your own laptop, the interactive white board, has your confidence been built up?	
33. T2: Yes, it's encouraging being in an environment where everybody is using it confidently,	33. School ethos of support for ICT use.
34. all the other teachers or a lot of other teachers using it confidently, seeing what they're getting out of it.	34. Some, not all are more confident
35. I'm being encouraged by the Headteacher, I suppose, for me to do it and keep trying and also having the Headteacher coming in and fixing things as we go along.	35 HT support
36. R: [Inaudible]	
37. T2: Part of it is being done where I can sit down and figure out myself, but part of it I have to do...	37. Time to try.
38. R: You wouldn't have done that would you?	
39. T2: No, there are limits in terms of there are still a lot of things I don't know how to sort out myself which I need to learn, and there are quicker ways to do things which I need to learn how to do as well,	39. More to learn
40. so there is still areas where I may have to ask [teacher's name] to come in and do. I'm going to have to rely on [teacher's name] a bit more which	40. Use of other teachers for help.

<p>is obviously going to be a disadvantage because</p> <p>41. [Headteacher] won't be here next year and that makes a difference so next year it will be more difficult. But the [Headteacher] has given me a grounding to build on.</p> <p>42. R: That's brilliant. Thank you.</p>	<p>41. Loss of key school members who guide ethos.</p>
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Recorded unit (R- Researcher T3- Teacher 3)	Central theme
<p>1. R: What did you decide to do?</p> <p>2. T3: This is a literacy lesson, so we are going to look at how to develop a story. If the children want to they can use a laptop to help them write the story.</p> <p>3. R: So, why is this important to you, is it a personal reason?</p> <p>4. T3: I don't normally use computers for this, you know I'm not that comfortable with them yet; but I am trying really hard to see if they make it better; I hope the children know how to get the laptops going! I am trying to put some of that training to good use.</p> <p>5. R: Good, thank you. What ICT are you using?</p> <p>6. T3: The laptops only, I've not got the hang of the new boards, so I will go through my introduction using the material I have already prepared.</p> <p>7. R: Okay, what learning are you expecting to take place?</p> <p>8. T3: How to plan and structure a story; I don't think the approach will be any different than when I did this without a computer but I would like to see how different it could be [indistinct words]... the children can try and see, but I worry that their typing skills are going to slow them down and that they could be trying too hard with the computer and not concentrate on the story journey process that I am teaching about.</p> <p>9. R: Okay, and the last point is what's expected to be achieved by all of this on a personal level as well as on a teaching level?</p> <p>10. T3: You know I'm not comfortable with computers. I can see their need for the kids for their future, but I don't think I can them see them being fully used in my classes before I retire. I am willing to try anything and I at least feel comfortable with this level of using. Using a wordprocessor. For the children, I will see how it goes.</p> <p>11. R: Okay, thank you. That's it.</p>	<p>2. Using wordprocessing</p> <p>4. Student familiarity with hardware.</p> <p>6. Use of laptops for learning.</p> <p>8. Using other skills - keyboard</p> <p>10. New use of ICT by teacher.</p>

Recorded unit (R- Researcher T3- Teacher 3)	Central theme
<p>1. R: So what learning took place there?</p> <p>2. T3: They spent so much time on their typing that in the end I had them stop and had them work on their paper versions.</p> <p>3. We got the story plan finished but not the story. I felt frustrated despite the help from [name of Teaching Assistant].</p> <p>4. R: Okay, fine, what were the problems with the technology, generally, within the lesson?</p> <p>5. T3: [Child's name] was very fast on the typing and did produce a good draft. [Children's names] didn't hardly do anything. Spent most of the time trying to type in their story but their typing skills aren't up to it. The laptops worked well, no problems, though one had to be started twice. The children seemed to like using them, but I don't think it helped with what I wanted to teach them.</p> <p>6. Maybe more time needs to be spent on teaching them typing?</p> <p>7. R: What areas would you change?</p> <p>8. T3: In my lessons? I wouldn't change my planning. Oh, you mean with the computers. I would not use them for this again. In SATs they have to write, in lessons they have to write. Using computers for projects may be good, but they [the children] don't know, don't use them enough to be as quick or productive.</p> <p>9. R: Anything in the way you did it, to use technology?</p> <p>10. T3: I looked at what [other teacher's name] has been doing. She is very good, but I don't think I can use them [computers] like that. I could see and help the children with simple wordprocessing but I was just frustrated by how long it took them to produce something that I was able to do with them before in half the time.</p> <p>11. R: Okay, now the basis of all of this is to work out the difference between what we were like 2 years ago and what we're like now. So, do you think you would have attempted this lesson 2 years ago?</p>	<p>2. Lack of keyboard skills affected time taken</p> <p>3. IT slowing down work, not enhancing</p> <p>5. Children enjoy using IT, teacher felt it hadn't helped her.</p> <p>6. Some time spent on keyboard skills.</p> <p>8. No reason to adopt IT</p> <p>10. Wordprocessing skills at basic level.</p>

12. T3: No, I wouldn't have seen the need. I use OHP and photocopy cut and paste sheets that I use for springboard activities. The OHP, if it goes wrong is easy to fix. Normally it's just the bulb. I did feel under pressure a little to use the computers.	12. More understandable technology
13. The training we tried wasn't very good and I still think of myself of a very beginner. In some respects I am glad that I don't have to work on using computers. I do remember when the big push was for using OHPs and to move away from just chalkboards, so maybe it is time to move on!	13. Reluctant adopter
14. R: How about your confidence in using the equipment?	
15. T3: I have been teaching for longer than I care to remember and I am afraid that my confidence in this new initiative is better left to the younger teachers like [teachers' names].	15. Age concern.
16. R: Is there <i>anything</i> [note change in question approach because of previous answers] about how you use ICT now as opposed to the status of how you used it a few years ago?	
17. T3: I feel a little ashamed to say that there isn't. But I don't think the children are any worse off. My SATs results are still as good!	17. Can't see necessity.
18. R: How do you think your skills have changed over the last 2 years, if so, how, and what's caused them to change? Is any aspect in terms of change?	
19. T3: You know when the NOF training came in I thought "Great! now I can learn!". But the training didn't help me – I don't have a computer at home and the way it was set up meant that I was jumping through hoops just for the school to get the money for the laptops it wanted. I just felt that for me, it so disappointing.	19. NOF training feedback
20. R: That's it, thank you. Well done.	