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**THE IMPACT OF ICT ON TEACHING IN DESIGN AND TECHNOLOGY AT KEY
STAGE TWO**

GRAHAM MORLEY

**A thesis submitted to the University of Huddersfield in partial fulfilment of the
requirements for the degree of Doctor of Education**

THE UNIVERSITY OF HUDDERSFIELD

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ABSTRACT

This thesis investigates the impact of computers and interactive whiteboards on the teaching of Design and Technology in Key Stage 2. Their use within education is having an influence upon the curriculum. Various investigations into the impact of Information and Communication Technology have been undertaken but these have principally involved CAD and CAM work within Key Stages 3 and 4 Design and Technology. Very few studies have looked at Design and Technology in the earlier key stages or the impact upon teaching and pupils at Key Stages 1 and 2. The literature review focuses on four key areas surrounding the research investigation: Computer Aided Learning; Cognition regarding the relationship of problem solving and higher level thinking; Pedagogy and its relationship to the use of computers in the teaching of Design and Technology and a review of the Design and Technology guidelines and the related issues regarding their implementation.

The research is based upon both qualitative and quantitative methodologies employing multiple sources of data collection. Quantitative data was collected through a survey of all primary schools in two Yorkshire Local Authorities. The qualitative data produced the basis for in-depth individual semi-structured interviews with a sample of Design and Technology Co-ordinators. The semi-structured interviews then formed the foundation for a focus group interview of Local Authority officers. Use has been made of an evidence trail which examines other sources of evidence such as conference papers, HMI, QCA, Ofsted and DfES reports.

The main findings indicate that the core subjects of the National Curriculum are taking the vast majority of teaching time. A broad and balanced curriculum is therefore no longer being maintained in the schools studied.

The evidence revealed that teachers were becoming familiar with the use of computers in the classroom. They understood the skills involved in using computers but were still uncertain as to the most suitable pedagogy. The majority of teachers who responded to the questionnaire and the semi-structured interviews, the Local Authority officers and some government departments regard the New Opportunities Funded (NOF) training as being a disappointment due to its over-ambitious aims and lack of pedagogical content. The introduction of interactive whiteboards (IWB) was initially viewed by teachers as another element of ICT to teach. However these have now been well received.

Those teachers involved in the study are finding it difficult to find time to either keep pace with or develop their ICT skills. This is reflected in teachers' limited use of computer programs. This is in direct conflict with the findings of Ofsted, which found that teachers were now using a broader range of programs.

Please note that the term Local Education Authority no longer exists as a statutory body. Throughout this thesis the term Local Authority is used instead.

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This research study has been challenging undertaking it at the same time as fulfilling a busy professional role. I would therefore like to express my thanks to my Director of Studies, with whose support I could not have completed the thesis, my colleagues in the Research University and the understanding of my family.

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GLOSSARY

AST	Advanced Skills Teacher
AT	Attainment Target
Becta	British Educational Communications and Technology Agency
BETT	British Education and Training Technology
CAD	Computer Aided Design
CAL	Computer Aided Learning
CAM	Computer Aided Manufacture
CHL	Cognitive Higher Learning
CML	Computer-Mediated Learning
CPD	Continuing Professional Development
DfE	Department for Education
DfEE	Department of Education and Employment
DES	Department for Education and Science
DfES	Department for Education and Skill
D & T	Design and Technology
HCI	Human Computer Interaction
HMI	Her Majesty's Inspectorate
IWB	Interactive Whiteboard
ICT	Information and Communications Technology
INSET	In service training
ITTE	Information Technology in Teacher Education
KS	Key Stage
LA	Local Authority
NAAIDT	National Association of Advisers and Inspectors in Design and Technology
NC	National Curriculum
NGfLP	National Grid for Learning Programme
NOF	New Opportunities Fund
Ofsted	Office for Standards in Education
PoS	Programmes of Study
RM	Research Machines
QCA	Qualifications and Curriculum Authority
SPSS	Statistical Package for Social Science
VLE	Virtual Learning Environment

CHAPTER ONE

1.0 INTRODUCTION

1.1 Overview

There can be little doubt that the use of Information and Communication Technologies (ICT) for teaching and learning in primary schools will only increase in importance (Selwyn and Bullon, 2000; DfES, 2003a; Becta, 2003a). The government funding of £700 million for the New Opportunities Fund (NOF) for the National Grid for Learning (NGfL) which started in 1998, was a clear signal to teachers that being ICT literate is seen as being a fundamental life skill not only for their pupils but also for themselves as well (DfES, 2003a). In 1977 Tony Blair, the then Prime Minister, stated;

Technology has revolutionised the way we work as it is now set to transform education. Children cannot be effective in tomorrow's world if they are trained in yesterday's skills.

(DfEE, 1997: 1)

The recent historical experience of professional development and in-service training of teachers has been a matter of voluntary commitment. Teachers are faced with rapid changes, demands for higher standards and improved quality; there is now a need for teachers to improve their skills capability, capacity and performance through in-service training, and also the Continuing Professional Development (CPD) of their skills, knowledge and understanding (Craft, 1996). Primary education is the foundation stone on which the government is building its vision of an 'information society' (Holmes and Gardner, 2006).

The place of ICT within the revised National Curriculum is very clear. All subject Orders (except Physical Education) now contain the following phrase;

Pupils should be given opportunities to apply and develop their ICT capability through the use of ICT tools to support their learning in all subjects ...

(DfES/QCA, 1999: 2)

Design & Technology is one of the seven foundation subjects. (DfE, 1995) Its aims and purposes, according to the Department for Education and Science (2004a), are concerned with offering opportunities for children to:

- *Develop their designing and making skills;*
- *Develop knowledge and understanding;*
- *Develop their capability to create high quality products through combining their designing and making skills with knowledge and understanding;*
- *Nurture creativity and innovation through designing and making;*
- *Explore values about and attitudes to the made world and how we live and work within it;*
- *Develop an understanding of technological processes, products, and their manufacture, and their contribution to our society.*

(DfES, 2004: 1)

Campbell *et al* (2000: 82) believe that the role of design and technology is to;

...equip students with the understandings and skills to participate effectively in productive and innovative activity in a world that is becoming increasingly technological.

Information and Communication Technology (ICT), under the original National Curriculum Orders, was a part of Design & Technology until ICT became a subject in its own right in 1995 (DfE, 1995). The present National Curriculum Orders for Design & Technology (DfES/QCA, 2000) states that, for Key Stage 2, the use of ICT should include;

Developing, planning and communicating ideas

1a: generate ideas for products after thinking about who will use them and what they will use them for, using information from a variety of sources, including ICT-based sources.

Working with tools, equipment, materials and components to make quality products

2e: use finishing techniques to strengthen and improve the appearance of their product, using a range of equipment, including ICT (for example, 'drawing' software or computer-aided design (CAD) software and a printer)

Knowledge and understanding of materials and components

4c: how mechanisms can be used to make things move in different ways, using a range of equipment including an ICT control program

(QCA, 2004:1a)

Within the teaching of Design and Technology there is a statutory obligation to include ICT, as per the above requirements being written into the programmes of study. The government acknowledged that there was under-usage of ICT capabilities in schools. Many teachers did not have the ICT skills required or feel confident with or understand the potential that e-learning and ICT could bring (DfES, 2003: 4). Since 1998 the government has made significant investment in ICT in schools through the National Grid for Learning Programme (NGfL) and subsequently they report that "...teacher confidence in the use of ICT in the curriculum has improved" (DfES, 2003: 5). The report is confident that the NGfL programme has had a profound effect on the use of ICT in schools both in the curriculum and non-curricular areas. (DfES, 2003: 7) However The National Association of Advisers and Inspectors in Design and Technology (NAAIDT) also recognised that there could be implications for primary schools arising from the revised National Curriculum.

For many primary schools, implementing these requirements across the curriculum will be the greatest challenge emanating from the revised National Curriculum, with significant training and resources implications.

(NAAIDT, 2000: 2)

The British Educational Communications and Technology Agency (Becta) (2003b) believe that ICT can aid pupils' learning in Design & Technology. ICT does this by enhancing their capability to explore their ideas and then to communicate and present them. ICT also provides a range of information sources to enhance their design and technology knowledge whilst also increasing the range of tools, equipment, materials and components for their products. ICT also contributes to pupils' awareness of the impact of ICT on the changing world.

1.2 The Thesis Framework

The research thesis examines the challenges set by the National Curriculum guidelines for Design and Technology and their interface with the use of computers. More in-depth qualitative analysis examines the impact that the guidelines have upon teachers' pedagogy. 'Pedagogy', in this thesis, is defined as;

...the act of teaching, and the rationale that supports the actions teachers take. It is what a teacher needs to know, and the range of skills a teacher needs to use, in order to make effective teaching decisions.

(DfES, 2007c: Accessed 16/5/08)

The thesis follows a traditional framework of introduction and context, literature review, methodology and analysis of results, followed by a conclusion which synthesises the main issues and their implications for teaching.

Chapter One reviews the context, rationale and aims of the research and the challenges inherent in the investigation.

Chapter Two is a review of the literature, consisting of the current trends and thinking related to the impact of the use of computers upon teaching and learning.

The first part takes the form of a review of the National Curriculum (NC) guidelines for Design and Technology at Key Stage 2 (KS 2) and their implications for teaching. It will examine what the National Curriculum say teachers should be doing with ICT in Design & Technology.

Secondly, there is a review of the wide range of available literature about the use of computers and attainment and its claimed benefits for raising attainment. These claims will be examined as to whether they can be substantiated.

The third part examines literature that suggests a possible conceptual framework for teaching using ICT to ensure maximum effect.

The fourth part investigates literature that relates to the correlation between computers and cognition, examining the relationship of problem-solving and higher-level thinking. What is it about a computer that engages pupils and what evidence is there to support these claims?

Chapter Three examines and justifies the methodology chosen to conduct the research study. It was initially decided that a mixture of quantitative and qualitative research, using both primary and secondary data sources, would provide a sound basis for investigation.

Chapter Four investigates the findings from the quantitative research which has been conducted using a questionnaire, completed by Key Stage 2 Design and Technology Coordinators in the two Local Authorities (LAs). The Statistical Package for Social Sciences (SPSS) was used to analyse the data.

Chapter Five analyses the qualitative data that has been collected from:

- Design and Technology Co-ordinator teachers within the two Las, using semi-structured interviews
- a focus interview with two Local Authority (LA) officers.

The data has been examined using a thematic approach followed by dilemma analysis to highlight any commonalities or differences. This chapter includes a comparison with the quantitative results where relevant.

Chapter Six synthesises the results of chapters four and five. The chapter relates back to the research aims and summarises the main findings in relation to each aim. It also considers the implications of the findings in relation to the perceived effectiveness of the teaching. The findings will be analysed and discussed in relation to the current literature, as reviewed in Chapter Two, for consistency and compliance. It will discuss what contribution the research can make towards research into the use of ICT and enhancing current teaching practice of Design and Technology at Key Stage 2.

1.3 Introduction

There has been a disparity between the required knowledge and skills of teachers in the use of the computer and an inability by teachers or pupils or both to learn those skills and techniques in primary schools (NAAIDT, 2000; Ofsted, 2002). That was until the New Opportunities Fund (NOF) (DfES, 2003) provided the basic training and CPD that primary teachers required.

The process of coming to terms with ICT is not just a one-off initiative but an ongoing process of professional development that requires continuous updating.

(Open University / Research Machines, 1999: 2)

The initiative's aim is to provide opportunities for teachers to develop "... an understanding of new approaches to planning, teaching, assessing and evaluating how ICT can improve, extend

and transform work in the class...” (Open University/Research Machines, 1999a: 2). The government wishes, through the use of ICT, to improve teaching and learning, with the belief that “... ICT has the power to transform teaching and learning.” (McCormick and Bolingbroke, 1999). As the Open University/Research Machines (1992) and McCormick and Bolingbroke (1999) have implied, ICT skills are generic and cross-curricular. The literature should, in general, reflect that and not be subject orientated.

Teachers in primary schools have to teach a range of subjects to teach the curriculum effectively and therefore will have an over-view of ICT in their teaching. The Design and Technology Subject Coordinator should be the teacher who has the technical knowledge and skills for Design and Technology but they may not be a ‘specialist’ in the subject. By questioning these ‘teachers’ a focused view should be achievable. The Design and Technology Subject Coordinator should be using ICT in their teaching; the research wanted to establish if this was happening and, if not, why not. The Subject Coordinators’ responses will possibly indicate to what extent their Continuing Professional Development (CPD):

- Gives teachers the support that they need to develop their pedagogical skills.
- Enabled teachers to appreciate the current research which indicates that ICT can be used in a range of different ways to improve teaching.
- Enabled teachers to understand how ICT can be used effectively to support the development of understanding across the curriculum.
- Gives teachers an understanding of the conceptual framework for a pedagogy that demonstrates highly skilled teaching strategies that integrate the use of ICT into the curriculum. (DfES, 2003c; Higgins, 2003; Loveless and Ellis, 2003).

It is difficult to assess what improvements pupils have made due to them using ICT: pupil attainments attributed to ICT activities are not directly assessed. The assessments are made of

the specific subject learning outcomes at the end of ICT-based lessons (DFES, 2003c). It is the understanding and thinking processes of pupils that are important, as recent research has shown that "... new ways of thinking and new representations are presented to pupils through ICT." (DfES, 2003c: 9).

1.4 Context

1.4.1 The Local Authorities

The two Local Authorities are situated in Yorkshire. They will be referred to as Authority A and Authority B. Both authorities were formed from existing LAs in the re-drawing of the boundaries in the early 1970s.

1.4.2 National Curriculum Documentation

The documentation is contained in the National Curriculum Programmes of Study for Design and Technology and The National Curriculum Programmes of Study for Information and Communications Technology.

1.5 School Provision

The research centred around 204 schools in two LAs within Yorkshire which had KS 2 pupils. These were middle and primary schools within the two LAs. Each school Coordinator

for Design and Technology was approached to answer a questionnaire regarding Design and Technology within their school. As already stated (Section 1.3), not all of the Coordinators would necessarily be Design and Technology specialists as subject leaders in primary schools often have to lead in subjects that they know very little about. No attempt was made to determine whether the Coordinator was specialist trained. The Design and Technology Coordinator will be referred to as 'teacher' throughout the data results unless otherwise stated. The questionnaires formed the basis of the both qualitative and quantitative data used in this thesis.

From the questionnaire replies, further semi-structured interviews with ten of the teachers took place based upon issues they had raised. These responses then formed the basis for a focused interview with two LA Officers - one from each authority.

1.6 The Research Problem

The area of research is centred on the use of computers in Design and Technology lessons as described in the National Curriculum Guidelines for Design and Technology. Whilst the guidelines do not give explicit information as to what effective teaching is, they do contain suggestions on how ICT can be used within Design and Technology topics, with an inference that by using ICT in their suggested way it will improve teaching. The guidelines inform what needs to be done but not how to do it.

The research will examine to what degree teachers' pedagogy incorporates the use of computers to enhance their teaching. McBer (2000) suggested that effective teachers in the future will need to be able to deal with distance learning and the constant changes in teaching

media. They will work in a climate of continuous improvement, taking ‘best practice’ and integrating it into their own so that it becomes standard practice. Team work will become the norm where it is valued and mutual feedback, given through lesson observation or other means becoming an integral part of professional development.

The researcher is a tutor for student teachers in a Higher Education establishment where it is important that ‘best practice’ is recognised, highlighted and becomes embedded as the norm of the university. This ‘best practice’ needs to be shaped by a distinctive frame which theorises the values, purposes, conditions and practice of active teaching. The role of practitioner-researcher is further discussed in section 3.9.2.

How is a teacher using ‘best practice’ to be recognised? McBer (2000) suggests that there are three factors for defining a good teacher. These are:

1. Teaching skills:

- which involve all pupils in the lesson by using appropriate differentiation to challenge all pupils
- by using a variety of activities or learning methods such as questioning techniques to probe pupils’ knowledge and understanding
- by applying teaching methods appropriate to the national curriculum objectives so that the lesson is structured and flows
- by the number of pupils who are on task through the course of the lesson.

2. professional characteristics:

- high expectations regarding class understanding of what they are doing, their ability to see links to previous work and developing work

- good time and resource management
- uses a variety of assessment techniques
- regular homework that is a continuum from the class-work
- pupils knowing what was good about their work and how it can be improved while feeling secure in an interesting and challenging learning environment
- there was peer support and pupils knowing where to go for help
- teachers being actively involved with pupils
- activities were mainly teacher led

3. Classroom climate:

The classroom will:

- be an effective learning environment that maximises opportunities to learn
- give a sense of security and order
- where pupils actively participate
- be an interesting and exciting atmosphere

Loveless and Ellis (2003) report higher education lecturers, when asked how they would wish to use ICT to improve their teaching, as giving the four following categories:

- *A manager of collaborative teaching and learning* – using the technologies to provide access to resources, research, preparation and presentation; then using the technology to develop materials with students who contribute their own ideas and annotations.
- *A director-actor* – using the technology to support teaching by linking high-quality texts, images and sound to structure; illustrate and represent ideas.
- *A facilitator* – using technology to improve students' learning experiences by using interactive communication with students not on campus.

- *Designer* – working in a team to produce high-quality interactive learning materials which enable students to engage with subject ‘content’ and give students feedback.

(Adapted from Loveless and Ellis, 2003: 72)

These four characteristics would appear to be appropriate for teachers, regardless of age range taught. Teachers’ knowledge, ideas, beliefs and values influence their practice (DfES, 2003c). Teachers need to have sound subject knowledge about a topic or subject area. They need to understand how this knowledge can be supported by the use of ICT in order to make the appropriate decisions about how and when to use ICT with pupils. As pedagogical style differs between subjects, the choice of and use of ICT resources will differ in terms of pedagogical practices.

1.7 Rationale

Computers have been in schools for more than twenty years. During that time they have become far more sophisticated, powerful and provide faster processing. Indeed the progress in computer technology is accelerating at such a rapid speed, that machines are becoming almost obsolete as soon as they are purchased. The initial users of computers tended to be mathematics or science teachers or people with an interest in electronics. The early computers were used by other class teachers mainly for word processing and they therefore tended not to keep abreast of the developments within this fast moving area of technology. When teachers realised that computers do a great deal more than word-process, they, unfortunately, found that they had not kept pace with this rapidly moving technology (Holmes and Gardner, 2006). To try and catch up was difficult. Teachers had to gain access to the technical knowledge that

was in a language they could understand. It would take time for the potential of ICT to be understood and for it to be embedded; it would appear to put off a number of teachers. Teachers, therefore, were losing out on the opportunity to maximise the experience of e-learning (Becta, 2002c, 2004; Holmes and Gardner, 2006).

...advances in technology mean the scope of opportunities have moved on relentlessly ... as the gap between “actual use” and “potential use” is not being reduced; i.e. the “goal posts” are moving at the same rate as practice.

(Tearle, 2003: 567 – 8)

...ICT would have been successfully embedded into classroom activity. That it has not, is due to the failure to train, to manage and to resource...

(Robertson, 2002: 407)

There has been a growing awareness of the possible impact of using computers during teaching; and the fact that the government has spent £230 million (by 2002) on NGfL training for ICT plus a further £20 million to encourage teachers to purchase personal home computers (Wheeler, 2001), should have had an effect on the pedagogy used by teachers. The training with NGfL mentioned earlier is only the beginning “...the complexity of the task of integrating ICT into the curriculum should not be under-estimated...” (Goodison, 2002a: 283).

1.8 Aims of the Research

The aims of the research are:

1. to investigate the impact of ICT on teachers in Design and Technology at KS 2;
2. to investigate issues affecting the use of ICT within the teaching of Design and Technology at KS 2

3. to investigate the use of interactive whiteboards during the teaching of Design and Technology.

To ensure transparency it is important to clarify the conceptual interpretation of the aims. The aims involved the:

- changes brought about by and use of ICT in Design and Technology
- effect upon teachers' ICT skills
- examination of any changes to teachers' pedagogy
- effect upon pupils.

This section gives an explanation of how the methodology was derived from the aims.

Aim 1 is related to whether there is a degree of professional development that teachers have gained.

To provide a framework for aim 1; the following elements were focused on:

- a) the approach to planning by the teachers;
- b) the quantity of resources;
- c) the professional value of the training and INSET to the teachers.

Element a) relates specifically to how planning is recorded and referenced to the National Curriculum. Element b) is where evidence of effective use of lesson resources was considered to play an important part in the success of the impact of the provision, the use of groupings to establish more effective teaching and the purpose of the teacher when using the resources.

Element c) relates to the specific aims of the teachers in raising their professional practice through their CPD and INSET by examining the impact of the courses on their insights into the value of ICT and how they will keep 'abreast' of developments within ICT.

Aim 2 was to establish if there were other factors also affecting teachers' use of ICT.

1.9 Summary

This chapter has highlighted the structure to be used within this thesis. It has put in context the research area as well as indicating some of the influences upon teachers from their use of ICT within Design and Technology that are to be examined throughout this thesis. The thesis will endeavour to establish if there are any other issues related to the use of ICT within KS2.

This chapter has also sought to indicate the difficulty in keeping pace with the fast moving world of ICT: how quickly teachers can be left behind if they are not willing or able to continue their professional development. It will examine how the government and LAs will ensure that teachers keep pace with developments within these two subject areas.

The government, through the then DfES, is forcing the pace of the change in our schools by trying to ensure that schools continue with their development in ICT in the hope that this will raise the standard of teaching.

Chapter 2 will examine some of those theories and the reasoning behind them; how they relate to the suggested pedagogy used in teaching when using ICT. It will look at whether the claims made for ICT can be justified and how they influence pupils and their achievements.

The chapter will also examine the requirements for using ICT in Design and Technology and teachers' perceptions of those requirements, as well as the implications for the ICT skill level required by primary teachers to be able to deliver the programs. It will also consider how government training initiatives were put into place to enable teachers to accomplish the delivery of the National Curriculum requirements.

CHAPTER TWO

2. LITERATURE REVIEW

2.1 Introduction

There is a comprehensive range of literature available about ICT, which reflects central government's agenda for developing ICT in teaching and learning (Selwyn and Bullon, 2000). Design and Technology also has a plethora of literature regarding teaching of the subject knowledge as found in the National Curriculum guidelines. However there is very little guidance on a suggested pedagogy for the use of ICT in Design and Technology. There is academic literature which investigates the use of computers across the curriculum, especially in Mathematics, English, Science and for enhanced learning (Ofsted, 2004). Most of the literature is based on a limited number of empirical pieces of research. The majority of this generic research into the use of ICT in the curriculum is based on work by the DfES or work commissioned by it and carried out by Becta (DfEE, 1997, 1999; DfES, 2000a, 2003d; Becta, 2001, 2007). There appears to be a limited number of reported empirical research studies that reflect the impact of ICT on Design and Technology. What there is, is concerned mainly with the use of CAD/CAM at Key Stages 3 and 4 (Rutland and Pepper, 2000; Eggleston, 2001; Wilson and Harris, 2003).

The main theme running through this Literature Review is the perceived application of ICT by primary teachers for teaching. The Literature Review will examine the means by which,

purportedly, ICT can help develop pupils' thinking skills and aid the transferability of those skills into other subject areas. The Literature Review will:

- Consider the positive claim and counter minimal claim regarding the impact of ICT on teaching and learning.
- Examine the suggested pedagogy that should complement the new technology.
- Note what training and professional development central government has initiated, to ensure a successful transition into this 'high tech' era.

The Literature Review will also highlight any other issues that writers feel are relevant to the smooth realization of ICT being successfully integrated into the curriculum.

Over the past twenty years there have been great changes to the educational system of the United Kingdom. A number of Acts are responsible: the 1981 *Education Act* enabled pupils with 'Special Educational Needs' to be integrated into mainstream schools, the 1986 *Education Act* removed the powers of the LA to set the terms of conditions of employment and empowered headteachers and governors with that responsibility. The 1988 *Education Reform Act* which brought about the greatest changes since the 1944 *Education Act* which Blandford (2000) lists as: *local management of schools (LMS); parental choice; National Curriculum (NC); league tables; continuing professional development and diversity*. But the most significant area of change was that of the curriculum where all children have an entitlement to access a 'broad and balanced' curriculum. This principle was further enhanced by the 1999 re-written *National Curriculum Handbook* (DfEE, 1999) which includes an overarching statement on inclusion which makes clear;

The principles schools must follow in their teaching right across the curriculum, to ensure that all pupils have a chance to succeed, whatever their individual needs and the potential barriers to their learning may be.

(DfEE, 1999: 3)

This did not come cheaply. It cost £700 million from the New Opportunities Funding for the National Grid for learning (DfES/Becta, 2003a). The European Community, for example, is spending 16 billion euros or £11 billion on a new generation of European programmes in e-education and culture from 2007-2013 (Holmes and Gardner, 2006).

A new funding system arrangement for LAs came in 2003-4 (DfES, 2003), giving CPD and training monies directly to schools, while LAs received significantly less monies.

Helsby and McCulloch (1997) feel that there are major implications for both the nature of schools and for the work of teachers through the local management of schools and the National Curriculum. They feel the key features are;

...administrative decentralization in the form of local school management; the introduction of stronger accountability mechanisms, including the use of teacher appraisal; and, significantly, a growing tendency to prescribe the curriculum of schools, often through the development of a national curriculum.

(Helsby and McCulloch, 1997: 1)

Cullingford (2001: 4) further suggests that;

This is a result of the politics involved. The Education Reform Act was a symbol of the will of politicians. It signalled the desire to interfere with the education system in a way unprecedented for the last one hundred years...

The major change according to Helsby and McCulloch, (1997) is that there are now three 'core' subjects (Mathematics, English and Science) which are the central focus of the National Curriculum, and seven 'foundation' subjects (Geography, History, Art, Design and Technology, Information and Communication Technology, Music and Physical Education), all of which have prescribed guidelines of content matter. This would indicate that the system

was moving from a teacher controlled curriculum to one which was to be ‘centrally’ controlled by civil servants and politicians with no or little reference to classroom teachers. The inference is that the subject knowledge is the key and teachers only have to deliver this ‘knowledge’. As Oliver (2001: 215) suggests, there must be more to being a teacher:

There is surely something in the concept of being a teacher which is about engaging in a dialogue with one’s pupils and exploring issues together. The teacher is not simply a repository of knowledge, who transmits this knowledge. The education process must be about something more than this.

While the politicians have imposed the National Curriculum it is still the teachers who have to implement it. Some teachers have reacted in a minimalist way (Helsby and McCulloch, 1997). They have attempted to teach what they regard to be the most relevant aspects of the general curriculum. Less experienced teachers tend to use the formal curriculum but they tend to go their own way the older and more experienced they become (Cullingford, 2001).

Design and Technology was introduced into English and Welsh schools as a distinctive subject in 1990 (DfES, 1990). England and Wales were the first education systems to make Design and Technology a compulsory subject for children from the ages 5 to 16 (Crown, 1988) although, as of 2002, Design and Technology is no longer compulsory after the age of 14, which downgrades both its status and importance (DfES, 2002a). The main objective of this early Design and Technology curriculum was to establish ‘design and make’ capability through Craft, Design and Technology activities. However the most significant and main shift in the Design and Technology curriculum was from producing ‘outcomes’ to a greater understanding of ‘process’ (Wilson and Harris, 2003). This is supported by Hope (2006: 78), who suggests that an important statement in the National Curriculum for Design and Technology for Key Stage 2 is;

3a – reflect on the progress of their work as they design and make, identifying ways in which they could improve their products.

There were further revisions to the National Curriculum in August 2000 where the Programmes of Study have set out two distinct parts: the ‘knowledge, skills and understanding’ and ‘the breadth of study’ requirements (DfES/QCA, 2000b).

With this dramatic development and change of emphasis in Design and Technology there have been, not unexpectedly, mixed results in the implementation of the subject. Ofsted has consistently reported the need for support from senior management (Ofsted, 2002, 2004, 2005a). Ofsted noted due to the lack of its perceived ‘non-academic’ status, that managers did not understand the subject, minimal time was given to it, there was no overall plan for the subject and consequently little progress made in primary schools. Ofsted has also highlighted the role of the subject co-ordinator as being central to the quality of Design and Technology in the primary school.

Effective leaders (co-ordinators) develop a coherent policy and promote progressively demanding tasks through a clearly structured scheme of work. They provide whole-school and individual INSET and support and give colleagues confidence in their teaching. Such responsibilities need time, yet only two-fifths of co-ordinators have any non-contact time to complete such tasks, particularly those involving working with colleagues.

(Ofsted, 2002: 4)

This Literature Review firstly will draw from research into ICT and learning. The teaching and learning will be in other subject areas as well as the specific area of Design and Technology. The Literature Review has concentrated on four main areas. These were:

- (1) Implementation of the NC guidelines [See section 2.2];
- (2) Computers and Attainment [See section 2.3];
- (3) Pedagogy for effective teaching and learning using ICT [See section 2.4] and

(4) Computer Aided Learning (CAL) and Cognitive Higher Level thinking (CHL) [See section 2.5].

These areas have been chosen as they are the central issues regarding the use of ICT in teaching, which in turn has a profound effect on the use of ICT in Design and Technology (McCormick and Scrimshaw, 2001; Becta, 2002a, 2003a; HMI, 2002) and thus they reflect the main concerns regarding this thesis.

Initially CAL is firstly examined to justify a generic use of computers in education and establish links between CAL and higher level cognition.

The second area Computers and Attainment is researched to establish whether there is any evidence to support the premise that computers can/do affect pupil attainment.

The third area is concerned with pedagogy framework for teaching using ICT; it explores and examines the available evidence to assist teachers to deliver their teaching effectively while using ICT.

Lastly, the National Curriculum Scheme of Work guidelines are examined to ascertain how the government think ICT should be implemented as highlighted in the 1988 Education Act (Crown Copyright, 1988) during Design and Technology lessons at Key Stage 2.

2.2 Implementation of the National Curriculum Guidelines for Design and Technology

Teachers now have what they regard as a workable framework with the ‘scheme of work’ for Design and Technology (Ritchie, 2001). The current framework, Curriculum 2000, was originally produced from the 1995 Dearing Report. The report developed into the 1999 guidelines (DfEE, 1999), which were drawn up in conjunction with teachers and professional associations, was generally regarded by teachers as workable. There were only minor amendments to the Dearing document to bring it up to date.

The requirements comprised two Attainment Targets (ATs) for assessing and reporting Design and Technology: Designing (AT1) and Making (AT2). These have now been amalgamated into one attainment target which comprises Knowledge, skills and understanding (DfES, 2007b). There is a single Programme of Study (PoS) for each Key Stage and greater clarity of the different types of activities involved in Design and Technology. Within the PoS there are now more references to Information and Communication Technology, with assessment being achieved through the attainment of the expectations for each taught unit module. There has been a reduction in content where there was an overlap with other subjects. Within the PoS there are still the elements of identifying needs, designing, making and evaluation (DfEE/QCA, 2000; Ritchie, 2001).

The Design and Technology Scheme of Work for Key Stage 2 concerning knowledge, skills and understanding states regarding the application of ICT specified that;

Teaching should ensure that knowledge and understanding are applied when developing ideas, planning, making products and evaluating them.

Developing, planning and communicating ideas

1 Pupils should be taught to:

- a Generate ideas for products after thinking about who will use them and what they will be used for, using information from a number of sources, including ICT-based sources*

Working with tools, equipment, materials and components to make quality products

2 Pupils will be taught to:

- e use finishing techniques to strengthen and improve the appearance of their product, using a range of equipment including ICT [for example, 'drawing' software or computer-aided design (CAD) software and a printer]*

Knowledge and understanding of materials and components

4 Pupils will be taught:

- c how mechanisms can be used to make things move in different ways, using a range of equipment including an ICT control program.*

(DfEE, 1999: 94-95)

In the 2000 revision of The Design and Technology scheme of work for Key Stage 2, there is a further reference and changes to the use of ICT.

The use of ICT has been made more explicit in the revised programmes of study, particularly at key stage 2, as have links between design and technology and the new national curriculum for ICT and the Information Technology scheme of work. In the units there are lots of opportunities for children to use ICT as a means of gathering information.

(DfES/QCA, 2000a: 5)

From the outset of Key Stage 2 there is a range of different types of software application for ICT work within Design and Technology. This can be observed from the units:

Year 3

- *Packaging – text and graphics, combining text and graphics*
- *Sandwich snacks – databases, collection and presentation of information, questionnaires and pie charts, analysis of data and asking questions*
- *Moving monsters - combining text and graphics, control, monitoring – What happens when..?*
- *Photograph frames - combining text and graphics*

Year 4

- *Money containers – repeat pattern images*
- *Storybooks - combining text and graphics, repeat pattern images, controlling devices*
- *Torches – controlling devices, control and monitoring –What happens when ..?*
- *Alarms - combining text and graphics, controlling devices, control and monitor – What happens when..?*
- *Lighting it up – controlling devices, control and monitor – What happens when...?*

Year 5

- *Musical instruments – writing for different audiences, collecting and presenting information: questionnaires and pie charts, analysing data and asking questions: using complex searches*
- *Bread - combining text and graphics, analysing data and asking questions: using complex searches, introduction to spreadsheets*
- *Moving toys – controlling devices*
- *Biscuits – collecting and presenting information: questionnaires and pie charts, analysing data and asking questions: using complex searches, introduction to spreadsheets*

Year 6

- *Shelters – analysing data and asking questions: using complex searches*
- *Fairground – controlling devices, control and monitoring – What happens when ..?*
- *Controllable vehicles – control and monitoring – What happens when ...?*

(DfEE/QCA, 2000b)

There is only one unit (Year 6 – Slippers) throughout the whole of Key Stage 2 that does not have a perceived opportunity for the use of ICT. (The researcher feels ICT could have been used to research the styles of slippers from around the world, data collected regarding who wears slippers at home, etc.).

These opportunities result in there being only five major types of software activity;

- 1) Word processing
- 2) Graphics
- 3) Data bases
- 4) Spreadsheets
- 5) Control.

These opportunities give rise to more than just ‘gathering information’ as noted in the revised 2000 scheme of work which suggests that Design and Technology is perceived as a ‘non-academic’ subject. Yet Duffy (2006) says that pupils at Key Stage 2 will only be involved in gathering information from a variety of different sources and analysing it. Hope (2006) suggests that the splitting of ICT and Design and Technology has enabled ICT to become cross-curricular, while its role in Design and Technology has diminished. This does not appear to be the case. Johnsey (1998) and Ritchie (2001) both suggest that there is a whole range of computer software applications such as:

- data-logging and analysis of the information
- appropriate presentation of information and data
- desktop publishing
- computer aided design
- music and sound
- simulations or modelling
- searches for information
- context specific, computer aided learning packages
- monitoring
- communicate with other peers and adults

(Adapted from Johnsey, 1998; Ritchie, 2001.)

Indeed Arnold *et al* (2004: 40) even suggest that video conferencing can be a useful tool for developing pupils' ability to talk about their designs and solutions, as well as improving their camera and conferencing skills. Hope (2006) agrees with pupils discussing their work and suggests that children need to discuss their design ideas with each other, raising Design and Technology to high level thinking.

This is a range of different types of program requiring different skills and knowledge. Do KS 2 teachers have those skills to effectively use the programs as they may only use the program for a few weeks once a year? Will teachers use the range of programs or will they limit themselves to a few programs they can manipulate easily?

ICT provides close ties between itself and Design and Technology. These have been recognised and advanced since the introduction of the National Curriculum (DfE, 1995). To

fully implement the software programs, as suggested in the above list, requires more than basic ICT skills. This is in sharp contrast to the Literature Review regarding pedagogy which brought into question primary teacher capabilities and skill levels.

There is evidence that, taken as a whole, ICT can exert a positive influence on learning, though the amount may vary from subject to subject as well as between key stages, no doubt in part reflecting factors such as the expertise of teaching staff, problems of accessing the best material for each subject at the required level, and the quality of ICT materials that are available.

(DfES/Becta, 2002a: 43)

2.2 Computers and Attainment

Today, technology plays a central role in sparking the imagination, facilitating learning and creating new possibilities in educational environments.

(Azlan, 2003: 1)

Azlan seems to be suggesting there are many ways for ICT to raise both attainment and motivation. Motivation and attainment were reported only in general terms with few of the studies - with the notable exception of *Ways forward with ICT* (Moseley and Higgins, 1999), *ImpaCT2* (DfES/Becta, 2002a) and *ICT and Attainment* (DfES, 2003b) - relating their outcomes to a conceptual framework to allow analysis. *ImpaCT2* was a breakthrough in linking research along with '*Attainment using ICT*' (DfES/Becta, 2003d). It enabled clear indications of the added value that pupil ICT use delivers to learning. However both the DfES and Becta state that before attainment can be enhanced pupils need to have a positive attitude towards school. Pupil attitude and behaviour are important when any teaching is to take place not just ICT teaching.

The Perceived Correlation between ICT Resources and Pupil Attitude and Pupil Behaviour

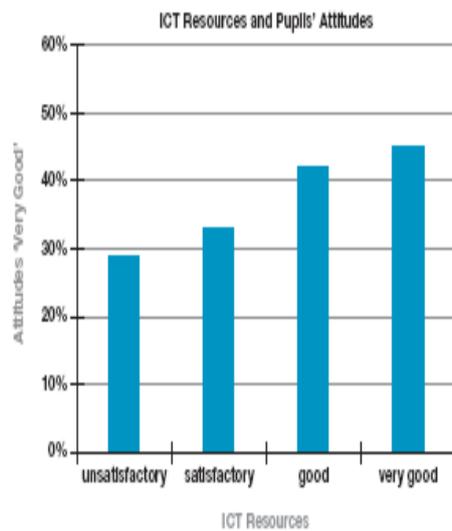


Fig. 1

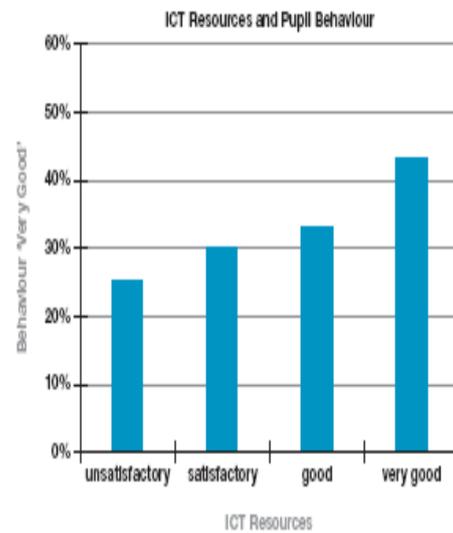


Fig. 2

(Becta, 2002b: 42)

Figures 1 and 2 shows the results of Ofsted inspectors' judgements based on pupil attitude and behaviour during their observation of lessons and of the school generally. They highlight how the use of ICT can have a positive effect on pupil attitudes and behaviour, as they also do in their report *'Embedding ICT in schools – a dual evaluation exercise'* (Ofsted, 2005d). Indeed Becta have identified five factors from the report (attitude, behaviour, attendance, standards, and parental views) identified from statistical analysis of Ofsted and QCA data - which provide a positive statistical relationship with ICT. The data was taken from school inspections during January 2000. At the time of the data collection Ofsted had changed its inspection framework to enable inspectors to provide new judgements in subject use of ICT.

Becta (2002b: 42) report that;

... (Figure1) there is a positive relationship between ICT resources and pupils' attitude...and ... (Figure 2) shows a similar relationship but in terms of pupils' behaviour.

Becta (2001, 2004) and Ofsted (2004) agree that ICT raises attainment when high levels of ICT resource are combined with effective ICT teaching (Figures 3 and 4).

Schools with good ICT resources and very good ICT teaching were as likely to be above national standards ...

(Becta, 2001: 1)

Good ICT and Standards

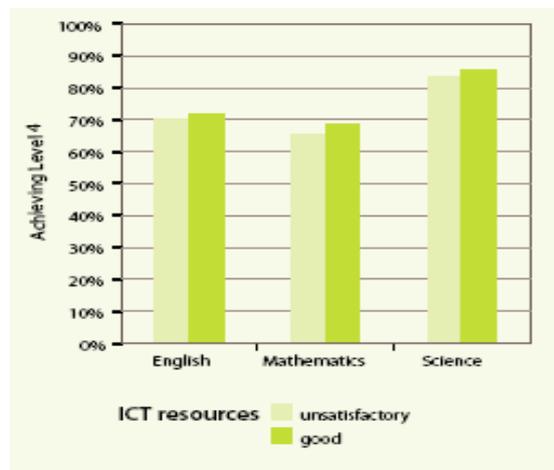


Fig 3

Average percentages of pupils achieving Level 4 in core subjects in the periods ending July 2001.

	Poor ICT	Very good ICT resources	Difference
English	64% (66%)	72% (75%)	+8% (+9%)
Mathematics	59% (63%)	69% (72%)	+10% (+9%)
Science	80% (74%)	87% (86%)	+7% (+12%)

Figures for the period ending July 2000 are shown in brackets.

Fig. 4

While Becta (2001; 2007) acknowledge that ICT alone does not raise standards, they report that it "...seems likely that the type of use is important." (DfES, 2003d: 6).

The availability of ICT is not, in itself, sufficient to enhance learning and teaching and, in turn, increase attainment.

(Becta, 2007: 63)

The findings from DfES (DfES, 2003a, 2007) also indicate the certain uses of ICT that are particularly motivating for pupils. It indicated that ICT is an important part of young people's culture for instance pop music and that ICT allows pupils to interact socially with a variety of different ICT experiences. Orłowski (2005) found that American pupils tended to neglect their homework in favour of playing games. Earlier research by Fuchs and Wobmann (2004) also identified this link, as well as internet use with a cross-section of international students.

Schools have reported that there is a range of different ways in which ICT has had a positive effect upon pupils' motivation being the major one. Frost (1998: 9) found that;

Children who were challenged by doing things 'the old way' were able to move on. The tools that started life as information processing tools became really special tools to enhance our teaching. These tools were for the mind.

Schools also reported to the DfES that ICT had enhanced pupil performance, cognitive performance, improved production and presentation of work which in turn had also increased pupil self-esteem, motivation and behaviour. The DfES analysed 'motivation' and concluded that there was a set of motives that engaged pupils. These were:

- Pupils had a reason for engagement (positive feedback, personal understanding, external regulation).
- 'intrinsic' motivation (engagement, attention holding).
- Pupil beliefs about their effectiveness in conducting the task.

(Adapted from DfES/Becta, 2003d: 11)

Becta (2003d) enlarge the list with the following positive motivators for pupils:

- Research (Wider range of resources)
- Writing and editing (Ease of editing)
- Presentation (Neatness and professional appearance)
- Variety of helpful ICT (Various types of equipment and programs)
- Behaviour (Attitudes and engagement brought about a change)

(Adapted from Becta, 2003d: 1)

It was important to establish whether the effect of ICT was to be short-lived or whether the benefits of ICT were longer lasting. The conceptual framework of the study showed that there was a positive impact of ICT on pupils. There was clear evidence that:

- When using ICT pupils were keen to learn
- Using ICT was a motivator in its own right
- Pupils could 'see' that they were able to achieve, with appropriate tasks and teacher aid
- When teaching and learning were the focus, the motivational impact was at its greatest
- ICT had an impact on and engaged with a variety of learning styles
- Only when ICT was fully embedded within a subject (e.g. Design and Technology) was there any impact on subject related cognitive and attainment.

The report gave insight into the fact that the motivational impact of using ICT was not purely about pupils enjoying using technology but also its motivation to learn;

... the study found evidence of a positive relationship between ICT use and achievement.

(DfES/Becta, 2002a: 2)

DfES (2004c: unnumbered) reported at their 2004 conference that "...ICT facilitated pupils' ownership of both their work and learning." Duffy (2006) reports that Ofsted (2005b) also found similar findings and results.

Ruth Kelly (the then Secretary of State for Education and Skills) also supported these findings when opening the education technology fair BETT (Sherriff, 2005). She quoted Ofsted reports supporting the positive influence of technology in education, which in turn support the government's claims that technology does raise standards. This is in total contrast with the research of Fuchs and Wobmann (2004: 4) who suggest the complete reverse. They say;

...computer use in schools does not seem to contribute substantially to students' learning of basic skills such as maths or reading.

Fuchs and Wobmann (2004) further suggest that having a computer at home and using a computer at school, will raise some computer skills but this may come at the expense of other skills such as mathematics and writing. Doubt about the impact of computers on pupil learning was first raised in *Fools' Gold: A Critical Look at Computers in Childhood* (Cordes and Miller, 2000). They quote Larry Cuban of Stanford University as saying;

...there is no clear, commanding body of evidence that students' sustained use of multimedia machines, the internet, word processing, spreadsheets and other popular applications has any impact on academic achievement.

(Cordes and Miller, 2000: 3)

There are only eight books or articles attributed to the reference section of *Fools' Gold: A Critical Look at Computers in Childhood*, which seems too few for such a hefty document. They quote from Cuban's book of 1986, when computers were still a novelty in schools. The researcher feels that this is somewhat misleading the reader by being very selective in the underpinning of their personal agenda. This report and the Alliance for Childhood's later report, *Tech Tonic* (2004), use reasonable arguments about nurturing creative environments,

but where the researcher disagrees with them, they conclude that technology inherently leads to less humanistic caring and nurturing of the environment. Technology can be misused and abused, but it would be better if we focused upon the ways technology can be employed in the service of learning.

2.4 Pedagogical Framework for Effective Teaching Using ICT

A review of research literature for the process through which skills and understanding of ICT are developed in children and the pedagogical framework for ICT has shown that literature in this area is sadly lacking (Webb, 2002). Reviewing the literature on pedagogy and the use of ICT in primary schools suggests a number of areas where it is likely that ICT could support and raise pupils' learning and attainment (Duffty, 2006; Holmes and Gardner, 2006; Barber *et al*, 2007; Becta 2007). It is not the technology itself that will achieve this but rather it is the teacher's subject knowledge and how ICT relates to it that is a crucial factor (Scrimshaw, 2004; Duffty, 2006; Barber *et al*, 2007). Becta (2007: 4) also state that;

...high-quality educational content enables the realisation of learner attainment gains, but only if accompanied by pedagogically-informed practice.

Studies reported in DfES/Becta (2003c) and Ofsted (2005e) show that although pupils were using computers in school, few pupils engaged in sustained periods of ICT use or used many different applications. Indeed the DfES (2005a: 8) stated that technology;

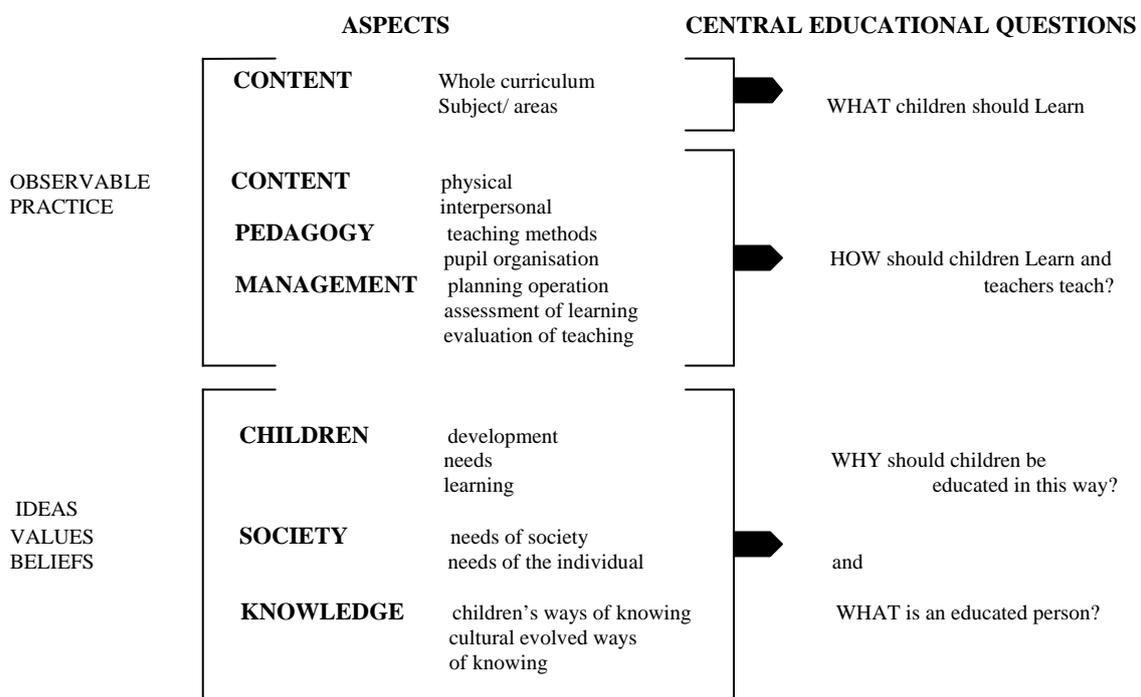
...has not yet transformed teaching and learning, but ...has made a major impact in many schools.

Indeed Becta (2007: 67) further say;

Most teachers believed that while ICT had enhanced existing practice, it had not been necessary to alter that practice to accommodate it.

Pedagogy is defined by Alexander (1992) as identifying teaching methods and organisation. Pedagogy is one of seven interrelated aspects which he identifies in his conceptual framework for educational practice. (See Fig. 5).

Educational practice: a conceptual framework



(Alexander, 1992: 84)

Fig. 5

Alexander's framework advocates that any pedagogy of ICT should be understood within a broader framework of educational practice; and yet DfES (2004c) and Ofsted (2005d) are fully aware that teachers need the opportunity to invest time in curriculum planning as they fear failure and lack confidence in this area. This is in contrast to what Becta (2007: 5) suggest. They say there are "...considerable improvements in practitioner competence and

confidence in using ICT in subject teaching...” But, in contrast, they also say “... there is a need for continuing professional development and development of communities of subject-specific ICT practice.”

To fully understand what is allied with good practice, teachers’ ideas, values and beliefs also need to be examined as well as their observable practice. What is observed in the classroom is therefore only a part of their educational practice. Becta (2007) also suggest that there is further need for the development of ICT pedagogy and how they can be supported. This is in contrast to Shulman (1987, cited in Webb, 2002), who focuses on the knowledge needed for planning, teaching, assessing and evaluating rather than teachers’ ideas and beliefs (Moseley and Higgins, 1999; Webb, 2002). There is common ground between the two opposing viewpoints regarding teachers’ knowledge base such as; content knowledge; pedagogical knowledge of teaching styles and classroom management; curriculum subject knowledge; professional perception of subject knowledge; a knowledge of and the characteristics of how pupils learn; a knowledge of a variety of educational contexts and an understanding of the place and value of education.

Teachers need to have sufficient subject knowledge and understand how this knowledge will be affected by the use of ICT in order to make decisions about using ICT with pupils (Moseley and Higgins, 1999; HMI, 2002; DfES/Becta, 2003d). Becta (2004: 5) also agree with this viewpoint as they say that one of the key factors that govern learners’ ICT experience is “... practitioner knowledge, commitment and time for integrating ICT into teaching and learning.”

As pedagogical subject knowledge differs between subjects, the choice and use of ICT resources will differ in terms of pedagogical practices for different subject teachers. In some subjects, teachers will use their beliefs to filter their knowledge bases at the outset of their planning. For example it might not be appropriate for the class to use collaboration and

exploration methods although the teacher does use that style of teaching at times - the teacher is only drawing on a limited subset base of knowledge.

The Becta (2003b: 4) reported that;

Teachers' pedagogies have a large effect on pupils' attainment. They influence the selection of the ICT resources, the preparation of the lessons, the way the resource is used with pupils in lessons, the level of guidance and intervention, and the level of integration of ICT use within the teacher's subject.

It is when teachers use their knowledge of the subject and the pupils' understanding of the subject, that ICT has the greatest effect (DfES/Becta, 2003c; Ofsted, 2005e). Eastingwood (2002: 193) says;

It represents a way of thinking ... to enhance the teaching and learning experience in a way that otherwise would not be possible.

The DfES (2005: 26) further suggest that a new understanding of the pedagogies appropriate for the 21st century is required, as the traditional methods have failed to deliver, and that "...we have both the opportunity – and the responsibility – to explore new approaches to teaching and learning." Earlier Becta (2004: 5) had also put out a cautious note by saying that "...we need to know more about what is effective."

There is also a gender issue regarding male and female attitude towards technology. Holmes and Gardner (2006) suggest that males initially saw technology as 'their domain'. This was also reflected in the manner in which the genders master the technology. Turkle (1984) is cited in Holmes and Gardner (2006: 68) as suggesting that there are two styles of mastering the technology; 'hard approach' and 'soft approach'. She believed that the hard approach was orderly, rational and systematic while the soft approach was more akin to an artist where the

approach was that of trial and error. Turkle (1984) further suggests that the hard approach was linked with the males while the soft was associated with females. Becta's (2004) literature review found that there was a small amount of evidence that points to the correlation between teachers' genders and their user levels of ICT. The European Commission (2003) states that 77% of male teachers and only 66% of females use computers off-line. When including internet use was examined the gap was even wider with 56% of males and only 38% of females using it.

Holmes and Gardner (2006: 69) also suggest that there are "...significant differences in attitudes towards technology between boys and girls..." and that having access to a computer at home increases confidence and subsequently computer use in school. They identify girls as tending to use a computer as a tool more than boys, who tend to use a computer for entertainment and gaming. This difference in attitude is also reflected in computer use in school, where boys tend to try and dominate. Where male domination is controlled then girls respond more positively to computers. Assertive girls do not dominate computer usage in single-sex situations. Boys would marginalise less able partners and complete any task on their own (Holmes and Gardner, 2006). It is therefore important that teachers ensure that there are equal opportunities for both boys and girls to use computers (Barber *et al*, 2007).

A major influence in the decision as to how, when and what ICT to use centres on the teacher's personal level of ICT skills (Becta, 2004, 2007; Scrimshaw, 2004; DfES, 2005.) Research suggests that the more effective teachers, who tended to have the higher ICT skills, would appear to perceive the potential of ICT more and be more willing to use it to support their teaching. Ofsted (2004: 5) state that the;

...increase in teachers competence in and confidence with ICT reflect in the quality of ICT and, to a lesser extent, in its more widespread and effective use in other subjects.

Becta (2004) go on to say that where teachers are reluctant to use ICT it is because they have received insufficient support or the facilities are inadequate.

Moseley and Higgins (1995: 17) have observed that;

For each of the teachers there were seemed to be a critical point of confidence and skill. Once this point was reached they were prepared to continue such development on their own.

Loveless (2003a) identified that teachers have a pragmatic approach to the acquisition of ICT usage in school. They will use pupils' greater confidence and capability to help themselves gain greater knowledge and lessen the gap between their experiences (Rashbass, 2000). She also observed that exclusive access to ICT use for both personal and professional work was an important factor in teachers' confidence and developing integrated use in school. This view is supported by HMI (2002) and Becta (2004, 2007). The more effective teachers also appear to be more adventurous in their approach to using ICT, in that they were willing to step outside their area of competence in order to improve their skills, knowledge and recognize the benefits for their teaching. Wheeler (2001: 7) suggests that;

Change may bring uncertainty, but the introduction of ICT into the classroom brings one thing of which we can be certain – teachers will need to adapt to change if they are to survive and keep pace with new methods and technologies.

Indeed the DfES (2004c) agree that teachers need to be encouraged by their senior management to be creative in their teaching and experiment even if things go wrong. They further agree that it is better not to try and do everything but rather that doing something well is better than doing everything poorly. Becta (2004: 9) also say that;

...there are technical and pedagogical challenges related to ICT becoming a natural platform for learning materials and support.

Becta (2004) also acknowledge that technical faults with ICT equipment are likely to lead to teachers not using ICT in their lessons as much as the teachers could or would like to.

Clearly what the computer does depends substantially upon the software that is being run at any time. Software has a range of 'support' for the learner; at one end of the spectrum the software will completely determine the sort of activities needed for it to be effective, while at the opposite extreme the software is neutral, an empty shell and open to manipulation by the learner.

The open-ended packages such as word processors, presentation packages, graphic packages, spreadsheets, data bases and music composers allow the learner to collect data and enter it into the package (Sunderland *et al*, 2002), thus becoming an ".....active creator of knowledge..." (Open University/ Research Machines, 1999a: 48). A teacher who has learnt how to use the spreadsheet tools in an integrated package can more quickly learn how to use its data handling and graphics functions. This will enable pupils to amend the data and then quickly and clearly see the effect of amending that data. Open-ended packages are also flexible in the kind of groupings that can be used; individual use or collaborative use, which can be a shared task or competitive. Again this is dependent upon teacher direction and intention. Although not all open-ended packages are neutral, e-mail and computer conferencing require that the learner is a recipient as well as an initiator with a built-in requirement for shared use. DfES (2004c) agree that pupils can help and learn from each other by using techniques and experiences previously not possible.

The closed type of software allows the learner to become a researcher for information and knowledge. The data is already in the package, predetermined by the software designer or the teacher. Packages of this nature are videogames, talking books, encyclopaedias, adventure games and simulations. Becta (2004) and Ofsted (2004) also report that teachers are becoming more discerning about their choice of software. DfES (2005: 28) suggest that in the future e-learning packages will be far more flexible enabling teachers to "...build their own individual and collaborative learning activities around digital resources." This is to ensure that technology enhances the quality of teaching and learning (DfES, 2005), and where it does not; they make use of more traditional methods.

Webb (2002) reports that Shulman (1987) emphasises that there is a powerful relationship between the comprehension of a new teacher and the styles of teaching employed: how they quickly change from a flexible, interactive style to a didactic teacher-directed style. Webb (2002) also reports that teachers' content knowledge also affects their teaching style. Where content knowledge is stretched, the teaching style becomes more didactic. Yet for full use of ICT in teachers' work, Becta (2004, 2007) and Scrimshaw (2004: 4) emphasise the need for teachers to "... make radical changes to the way they teach." What they suggest is a change from a 'teacher-centred' model to a 'student-centred' one. Holmes and Gardner (2006) agree with this shift in focus. Fabry and Higgs (1997) cited in Scrimshaw (2004: 13) also say;

...teachers must make two radical changes – not only must they learn how to use technology, but they must also fundamentally change how they teach.

This change in teaching will be a radical one (Wheeler, 2000 cited in Becta 2007). Holmes and Gardner (2006) looked at the history behind mass education in the western world. The state set the curriculum, the teaching style, when and where the teaching would take place. Now with e-learning all that can completely change. ICT can produce a resource-rich

education for all. Pupils can benefit from visual demonstrations of concepts which connect theory with practice thus enable pupils to understand those concepts much easier. The teaching can be flexible as to when it is delivered, there will be no limitation on where it can be delivered, and learning can be tailored to the individual and with greater student engagement and peer support (Holmes and Gardner, 2006). Wheeler feels that the teacher is now more concerned with the development of skills rather than knowledge (Wheeler, 2000 cited in Becta 2007).

To ensure that teachers could gain in competence and confidence to use ICT effectively, in 1998 the government spent £1.2bn on the National Grid for Learning programme (NGfL) (Ofsted, 2004). This was intended to improve teachers' ICT skills as well as enhance teaching and learning (Prime Minister, 2000).

The NGfL was initially produced in response to the Stevenson Report (1997) that identified inadequate hardware, little software related to the curriculum and variable teacher skills and attitudes limiting the spread of ICT usage within schools. HMI (Ofsted, 2005e) report this funding as being one of the three contributing factors in raising the quality of teaching using ICT, as resources in schools are now at an unprecedented level. Yet Ofsted (2004: 13) state that the NGfL training was to "...raise awareness of staff regarding ICT and the requirements of the National Curriculum." The intention of the NGfL was to enable teachers to integrate ICT in their work and then develop an action plan for their future professional development in the use of ICT. Charalambous and Karagiorgi (2002) report in 2001 that Ofsted had reported that the majority of teachers had not completed their basic training. Yet HMI and Ofsted have reported a year later that;

The use of ICT in primary schools is increasing and becoming a much more regular and effective feature of teaching and learning.

(Ofsted, 2002: 9)

Yet Ofsted (2004: 12) later reported that;

...training made a limited contribution to their awareness of subject-specific ICT applications and did not encourage them to consider issues of teaching and learning with ICT.

From the quotes Ofsted appear to be a little confused as to what was the purpose of the NGfL training and just what impact it had on teachers and their use of ICT in school. Becta (2004) suggest that training courses that lack a pedagogical aspect, while still having an element of skills training, are likely to be unsuccessful.

This is not peculiar just to Britain. Charalambous and Karagiorgi (2002), Zhang (2004) and Fletcher (2006) report this phenomenon as a world wide problem. Cummings (1998 cited in Fletcher, 2006: 208), further suggests that teachers in America, as in England, have the knowledge and skills to integrate technology into their teaching but do not have the time. Becta (2004), DfES (2004a) and Ofsted (2005d) also report that teachers do not have time to ‘develop’ their skills with new software, hardware and peripherals. Teachers are also very aware of the extra work involved in incorporating new technology into their lessons (Holmes and Gardner, 2006). Fabry and Higgs (1997 cited in Becta, 2004: 15) state that “...learning new skills in any profession requires time”. Franklin, (2000 cited in Fletcher, 2006: 209), states that teachers in the USA are having a very similar experience in that;

...technology integration will not be achieved in the schools until we are trained and have the time to practice it in our classrooms.

Quality experiences of the NGfL training in primary schools is closely associated with strong leadership by the head teacher (HMI, 2005; DfES/Becta, 2003d, 2005). Head teachers and

senior management are becoming more aware of the developments in ICT to provide very different learning opportunities and a need to design an 'integrated pedagogy' (Cornu, 1995).

According to Van Melle and Cimellaro (2003: 277);

An important aspect of ICT infusion...is that the school work with a clear sense of what it is trying to accomplish in relation to student learning.

Indeed HMI (Ofsted 2005e: 5) say;

...the leadership of the headteacher is critical...For pupils to gain the most from the resources available staff need to work with a clear vision of how this might happen and need strong leadership in developing their own capacity to develop their use of ICT ...

This is also supported by DfES (2004c) who also say that clear leadership and a shared vision is a key enabler, while a lack of vision from the management can be a major barrier.

In October 2007 NCSL (National College for School Leadership) and Becta have introduced SLICT Strategic Leadership of ICT (SLICT) which is intended to deliver a;

...programme (that) gives school leaders the tools to draw up a strategy which places technology at the centre of learning and teaching.

(WWW.ncsl.org.uk Accessed 30/4/2007)

The programme is to ensure;

Benefits for primary school leaders

- *consider the strategic issues of ICT*
- *gain confidence in your professional judgement*
- *develop skill, knowledge and understanding to lead ICT.*

Benefits for schools

- *the programme will enable you to stimulate and drive a clear strategic vision of ICT in your school*
- *it will give you the opportunity to clearly evaluate solutions and options... pupils' learning will be enriched and improved.*

(Adapted from WWW.ncsl.org.uk Accessed 30/4/2007)

The SLICT programme has been set up to assist headteachers who;

...need greater awareness of how ICT can impact on teaching and learning and may need to look beyond the school for this.

(Ofsted, 2005c: 6)

NFER/Harris and Kington (2002) identify the following important key features of the management style to ensure innovative classroom practice:

- clear vision of the school's goals, which are embodied in both the practices and plans for future development
- a willingness to take managed risks, and find creative ways of meeting their needs
- entrepreneurial skills in approaching a variety of organisations for support and/or resources that would impact upon the school.

It would appear that central government has recognised the need for leadership from the leadership team of the school in taking the school forward in ICT and not relying upon the haphazard structure now in place where teachers 'pick up' their knowledge, skills and understanding from a variety of sources.

HMI (2002, 2005d, 2005e) and Ofsted (2004) acknowledge the fact that where senior managers have recognised a priority in ICT training and have taken an active interest in teachers' progress throughout the training, the training has been most successful and has been integrated into existing good staff practice. Ofsted (2004: 4) also say that the New Opportunities Funding (NOF) training "...continued to disappoint in relation to its stated intentions" and was "...overambitious."

The NOF aim was to promote;

...teachers' understanding of the pedagogic issues related to ICT use and their identification of what ICT adds or does not add in different learning situations.

(Ofsted, 2004: 8)

But they go onto say;

...where training was successful, this usually involved school taking a strong lead to ensure that it met their need.

(Ofsted, 2004: 4)

DfES (2003c, 2004c, 2005); Becta (2004, 2007); HMI (Ofsted, 2005e) and Ofsted (2005d) recognise the value and support of the head teacher who has to establish a long-term plan for regular continuous professional development within ICT for staff. As new technology and software become available so too does the need for staff up-dating in that technology (DfES, 2004c, 2005; Ofsted 2005d, 2005e).

The pedagogy used by teachers will be influenced by how ICT is being used; the learning of ICT (the subject); using ICT as a tool for learning; learning through ICT (Ofsted, 2004). The learning of ICT is set down by the National Curriculum/ Qualification and Curriculum Agency (DfEE, 1999) which defines what skills and knowledge associated with ICT should be taught. The use of ICT, especially computers, to support teaching includes activities such as word processing for ease of re-drafting, the drawing of graphs from data input or the modelling of data to observe the effect of a changing factor. This is where ICT is used, within a subject area, only as a tool. Ertmer *et al* (1999 cited in Scrimshaw 2004) has also highlighted that there are three levels of computer use as a tool. These involve using ICT as:

- a supplement to the curriculum (i.e. reward)
- a reinforcer or enrichment of the curriculum content
- a facilitator for an emerging curriculum.

Ertmer *et al* (1999) observed that teachers were more likely to use ICT at more than one level simultaneously and that a teacher could continue at one level indefinitely, given that this was in-keeping with the teacher's beliefs, thus promoting a 'teacher-centred' model.

Learning through ICT is when software programs are provided which create an environment for the computer to become an ‘assessor and tutor’ (Holmes and Gardner, 2006). This highlights the two different aspects of ICT; the ‘Learning with ICT’ and ‘using of ICT’. A great deal of research and thinking has gone into concentrating on the *using* of ICT rather than the *learning* of ICT (Fowler and Mayes, 1999; Webb, 2002; Barber *et al*, 2007). The research has concentrated upon the discussion of constructivism;

...a subset of constructivism which is built on the assumption that children will do best by finding for themselves the specific knowledge they need in a supportive environment making use of concrete representation.

(Webb, 2002: 247)

Other theoretical perspectives have been discussed such as behaviourism, authentic learning, meta-cognition and more recently socio-cultural theory (Webb, 2002). Within the teaching profession there are different views as to their importance and interrelationship. Can the skills, processes and knowledge required for the use of ICT be acquired or taught while using other subjects? This debate has been raging for many years with regard to whether ICT capability should be developed through teaching ICT as a separate subject or through using ICT in an integrated, cross-curricular manner. More research is required. Webb (2002) suggests that the current thinking is that ICT evolves, initially, as a separate subject and through integration and “...towards a transforming role in which ICT is accepted as a pedagogical agent in itself” (Webb, 2002: 239). This suggests that ICT, in latter years, would not be taught as a self standing subject. It also gives a clearer definition of what is to be taught but no suggestion as to the pedagogical framework required to teach the courses.

McLoughlin and Oliver (1999) define the pedagogical roles for teachers in technology supported classroom as including; setting joint tasks, rotating roles, promoting student self-

management, supporting meta-cognition, fostering multiple perspectives and scaffolding learning. Some of these findings are also reflected in the work of Harris and Kington (2002) who identify common pedagogical themes for the teaching of ICT. These were; Pupils were given greater independence and responsibility for their own work and progress; Pupils supported each other; Pupils developed new communication and social skills; Pupils worked towards targets and/or deadlines for the submission of work; Pupils were encouraged to reflect on their work and Teachers identified possible solutions for their pupils. Harris and Kington (2002: 12) quote a teacher as saying;

We're moving from teaching people everything to teaching people where they can find things.

This is a changing role for teachers from that of information giver to one who is an enabler and who encourages reflective practice (Becta 2007).

Loveless (2003b) has observed that even when teachers claim to use ICT in their pedagogical approach there are discrepancies between their statements and their classroom practice, which focus on computer skills rather than integrated learning intentions. The DfES/Becta (2003c) report on 'ICT and Pedagogy' highlights the tension between academic and research literature and the views of practitioners regarding pedagogy. The academic/research view supports a model that is active construction of meaning and endeavours to help learners learn about learning, while teachers may adopt a simplified model of practice due to a variety of constraints, which could be the basis of further research.

From the literature review it would appear that the use of ICT could change teachers' pedagogy from a didactic style to one which will allow:

- More pupil choice regarding work

- More individual learning
- More pupil-centred tasks
- More pupil collaborative working
- Problem-solving as opposed to direct teaching
- More cross-curricular links
- Time for pupils to reflect on their work

(A resume of Grabinger and Dunlop, 1995; Griffin, 1995; Easingwood, 2002;

DfES/Becta, 2003d)

Pittard (DfES/Becta, 2003d: 17) reports that;

...the crucial component in the use of ICT within education is the teacher and her pedagogical approaches.

Cuban (2001 cited in Holmes and Gardner 2006: 32) suggests that when integrating new technology into their curriculum, teachers "...sustain existing patterns of teaching rather than innovate". Indeed HMI (Ofsted, 2005e: 1) reported that;

Almost all teachers are now confident to teach the National Curriculum in ICT, but many still find difficulties in helping pupils to apply what they have learned to work in other subjects.

Becta's (2004:17) Literature Review suggests that there is an "...inherent resistance to change within the teaching profession that is a barrier to the use of new technologies". They go on further to say that educational change is a slow process with teachers needing time to gain experience with computers.

This would not appear to be the case with Interactive Whiteboards (Ofsted, 2004, 2005d). Ofsted report that recently there has been a substantial increase in teachers using Interactive Whiteboards as teaching tools. Ofsted (2004) further report that when used by an effective

teacher, Interactive Whiteboards have helped to produce excellent lessons as they help bridge the gap between concrete and abstract. Interactive Whiteboards have led to an increase in the pace and quality of learning during schools. This is achieved by being able to use large and colourful text, shapes, data, illustrations and animation which engage pupils and aids in the speedy development of ideas and acquisition of new knowledge (Ofsted, 2004, 2005d).

2.5 Computer Aided Learning and Cognitive Higher Level Thinking

In this review the researcher has limited himself to looking at computer-based technologies that are used to handle information and aid communication.

Learning can have very different meanings in different situations. There is a great deal of difference between learning mathematical facts and learning how to play rugby. This review is concerned with “...complex thinking that requires effort and produces valued outcome...” (Wegerif, 2002: 3).

As well as there being different types of learning, there are also different theoretical approaches to the study of learning. The four major influential learning approaches are: Behaviourism, Constructivism, Humanism and Participatory.

The different approaches to learning, as show in Fig 6, involve contrasting ideas as to the purpose and process of learning. Their key principles are discussed below.

Four Orientations to learning

Aspect	Behaviourist	Cognitivist Constructionist	Humanist	Participatory
Learning Theorists	Thorndike, Pavlov Watson, Tolman, Skinner, Suppes	Piaget, Ausubel, Bruner, Papert	Maslow, Rogers	Lave, Wenger, Cole, Wertsch, Engestrom
View of the Learning Process	Change in behaviour	Internal mental process including insight, information processing, memory, perception	A personal act to fulfil potential	Interaction/ observation in social contexts. Movement from the periphery to the centre of a community of practice
Locus of Learning	Stimuli in external environment	Internal cognitive structure	Affective and cognitive needs	Learning is in relationship between people and environment
View of Transfer	Common elements shared by different contexts	Over-arching general principles	Changes in self- identity as a learner	Transfer problematic
Purpose in Education	Produce behavioural change in desired direction	Develop capacity and skills to learn better	Become self- actualized autonomous	Full participation in communities of practice and utilization of resources
Educator's Role	Arrange environment to elicit desired response	Structures content of learning activity	Facilitates development of the whole person	Works to establish communities of practice in which conversation and participation can occur

Fig 6

(Wegerif, 2002: 9)

Behaviourism

The Behaviourists believe that the focus should be the observable changes to behaviour and that it is one's environment that shapes one's behaviour. They also consider continuity and reinforcement as being essential for learning. They believe in the stimulus- response (S-R) theory of learning. You give people a stimulus, then you reinforce what you want people to do, ignore or punish what you want people to stop doing. The four key principles for learning are:

- Activity is important – not passive learning
- Repetition, generalisation and discrimination are important notions – frequent practice in differing context are essential for the acquisition of skills
- Reinforcement as a motivator – positive rather than negative reinforcement
- Clear objectives – pupil knows what will be achieved.

Cognitive Constructionism

There was a belief among psychologists (Smith, 1999) that there was too much emphasis on overt behaviour, single events and stimuli in behaviourism. The cognitive constructivists thought that you need to look at patterns of behaviour or at the whole rather than the sum of the component parts. Cognitive constructionists were more interested in the mental processes – the act or process of knowing. The main principles for effective cognitive constructive learning are that:

- Instruction should be well organised – easy to learn and remember
- Instruction should be clearly structured - logical relationships between key ideas and concepts
- The perceptual features of the task are important – the way a task is displayed should make the problem clear to the learner
- Prior knowledge is important – helps things to begin to fit together more easily
- Differences between individuals are important as they will affect learning – differences in learning styles influence learning
- Cognitive feedback gives information to learners about their success or failure – reinforcement can come through giving information rather than a reward.

The constructivist view of learning fits very well with pupil-centred ICT learning environments, Computer Aided Learning, where the pupil actively constructs their knowledge building upon what they already know. (Smeets and Mooij, 2001; Robertson, 2003).

Humanism

The Humanists reject the notion of reductionism preferring to treat people as a whole (Smith, 1999). Maslow's hierarchy of motivation is a well known example of humanism. Only when

the lower needs are fulfilled can higher self actualization take place. Basic needs need to be fulfilled before people can consider higher level needs.

Rogers (1993) believed that education required the whole person and their experiences for there to be learning that combines the logical and intuitive, the intellect and feelings. The main elements required for learning, humanists believe, are:

- A high quality of personal involvement – the whole person in both feelings and cognitive aspects being in the learning event
- Self-initiation – could have outside stimulus but there is an inner willingness to continue discovering, comprehending and grasp
- Pervasiveness – it makes a difference in the behaviour, attitude and perhaps personality
- Learner evaluation – knows whether it is what is needed, what they want and enlightens ignorance
- Its essence is meaning – meaning is interjected with whole experience.

The Humanists viewpoint gives a positive view of people and their ability to control their own destiny and individual development. This viewpoint is in keeping with Smeets and Mooij's (2001) view of how learning takes place using CAL.

Participatory

The Participatory theorists believe that people learn from observing other people in a social setting. Attending to behaviour, remembering it as a possible paradigm and then playing it out in a different situation, all are key aspects of observational learning.

The situated learner theory of Lave and Wenger (1991 Cited in Smith, 1999) put learning into social relationships. Here the theorists are asking;

...what kind of social engagements provide the proper context for learning to take place...

(Lave and Wenger, 1991: 14. cited in Smith, 1999)

The Participatorists believe that people join communities of practitioners, observing and assimilating the required knowledge and skills to enable them to become full and active members of that community. The key principles of situation/ social theory are:

- Learning is in the relationships between people – when people get together particular pieces of information take on a relevance and are passed on
- Educators work so that people can become participants in communities of practice – they explore what is required to enable people to fully participate within the communities. Learning is not just the acquisition of concepts but ways of behaving, values and identity
- There is an intimate connection between knowledge and activity – learning is a daily event. Problem solving and learning from experience become central processes.

(Adapted from Smith, 1999)

When using ICT, primary pupils are expected to work in small groups or in pairs, as research has shown that this is a most effective method of learning (John, 2004; DfES, 2004c, 2005; Holmes and Gardner, 2006). Working in groups or pairs is part of learning to participate in a community. A school or classroom is a special type of community that has specific ‘content’ of learning as well as its norms, values and practices.

Greeno, *et al* (1996) reason that there are three main schools of learning theory:

1. Behaviourist/ empiricist: learning as acquiring by association
2. Cognitivist/ rationalist: learning as acquiring and using conceptual and cognitive structures

3. Situative/ pragmatist-sociohistoric: learning as becoming attuned to constraints and affordances through participation.

Each of these schools of learning has contributed to some aspect of learning: Behaviourists leading towards basic skills; Cognitivists working on meta-cognition and conditions of transfer and Participatorists highlighting the importance of cultural tool-systems and communities.

McCormick and Scrimshaw (2001) and John (2004) suggest that the way teachers view learning will influence how they act in the classroom. They state that if a teacher believes that learning is an individual construction of knowledge then they will favour a cognitive constructive approach to their teaching. This is where knowledge is in the head and matches reality outside the head and can be viewed as being objective. Those who favour the social aspect of learning focus on the shared creation of knowledge and consider subjective views of knowledge.

2.6 Transferability and Thinking Skills

Learning has to have meaning for pupils; pupils need to have a global picture of why they are learning what they are learning (DfES/ Becta, 2003b, 2003d). One of the major aims of education is the transference of skills to other curriculum areas (Moyle and Robinson, 2002; Wegerif, 2002; DfES/Becta, 2003d). Greeno, *et al* (1996:16) define learning transfer as being;

...the process by which knowledge is increased or modified. Transfer is the process of applying knowledge in new situations...Educators want the knowledge that is acquired in school to apply generally in students' lives rather than being limited to the situations in classrooms where it is acquired...they (educators) want knowledge to transfer.

The nature of work in our society is being driven more and more to a technological one, where information and knowledge are the main products, not materials. Workers in this type of society require transferable thinking skills more than content knowledge or task-specific skills (Wegerif, 2002.). Holmes and Gardner (2006: 56) feel that "...identifying and delivering key intellectual and technical skills is of interest to all educators." The DfES (2005: 27) also report that ICT is an ideal medium for "...helping learners develop the skills they require for the knowledge-based economy..."

ICT enables pupils to have access to the latest information on a variety of subjects (DfES, 2004c; Holmes and Gardner, 2006). Yet Haines (2004) suggests that people do not use the internet for self advancement and that 'lifelong learning' has been shunned by most communities. Holmes and Gardner (2006) suggest that this is not the case and that lifelong learning has been growing in importance as people realise that they continually need to develop their skills and knowledge in a rapidly changing world. They feel that lifelong learning is not just about supporting economic growth but is an investment in human development.

There is evidence, according to Grabinger and Dunlap (1995), that students are not particularly strong in the areas of thinking and reasoning. There are far fewer learning objectives concerned with higher-order thinking than for lower-order learning (Watson 2001). Watson further cites Ofsted (2001: 256) as saying "...For far too many pupils the location of information remains an end in itself and they present the information unprocessed." Orłowski (2005: 1) suggests that pupils are "...awash with 'facts', but don't know what to do with them" and that "...schoolchildren are developing a 'problem-solving deficit disorder' and losing the ability to analyze." This, according to Grabinger and Dunlap (1995), is in part due

to the didactic style of teaching which decontextualizes examples and restricts problem-solving situations thus causing an inability to transfer knowledge and skills to other areas. Pupils have information presented to them as facts to be memorised rather than as tools to solve their problems. This is what Grabinger and Dunlap (1995) term 'inert knowledge'. The ability to transfer knowledge and use that knowledge in different areas requires a different form of thinking. DfES/Becta (2003d: 13) report that "...there is relatively little use of it (*ICT*) as a direct means of developing pupils' cognitive capabilities in subject learning." Yet Wegerif (2002:1) reports that "...the use of new technologies (*in schools*) is often linked to the development of thinking skills or 'higher order thinking'.

Thinking skills are hard to define but possibly not to recognise and teach (Wegerif, 2002). The thinking skills in the National Curriculum, Wegerif (2002) considers as being 'reasonable' and very similar to information-processing, reasoning, enquiry, creative thinking and evaluation. He further highlights the fact that most approaches to teaching thinking skills also embrace broader issues such as;

...engagement in dialogue, the formation of self-identity and the importance of a supportive culture...

(Wegerif, 2002: 11)

Frost (1998: 9) highlights the fact that pupils gain an understanding when they are encouraged to "explore... interpret" the data they have collected. The DfES (2005: 29) report that;

E-Learning clearly supports the development of ICT skills, but also offers a highly interactive environment for practising aspects of other generic skills, such as observation, textual analysis, communication, data interpretation. E-Learning innovation must be focused on the learning activities that support both skill learning and understanding.

Under the current government, thinking skills have become an important aspect of the National Curriculum schemes of work (Selwyn and Bullon, 2000). Wegerif (2002) believes that this is due to the technology-driven changes in the work place and that workers now require transferable thinking skills rather than content knowledge or task-specific skills. This is what Fluck (2003: 1) calls "...the post-industrial model of schooling". Soloway (1993: 28 cited in Nulden, 2001) says;

Schools today are structured more for the industrial age ...problem is, those factory jobs don't exist anymore.

The work force is now required to know how to learn new things since the accelerating technological changes are making old skills and knowledge redundant and generating needs for new skills and knowledge.

Learning to think critically, to analyse and synthesize information to solve technical, social, economic, political, and scientific problems, and to work productively in groups are crucial skills for successful and fulfilling participation in our modern, competitive society.

(Grabinger and Dunlap, 1995: 7)

The National Curriculum highlights the importance of thinking skills in teaching by stating that;

By using thinking skills pupils can focus on 'knowing how' as well as 'knowing what' –learning how to learn. The following thinking skills complement the key skills and are embedded in the National Curriculum.

Information-processing skills

These enable pupils to locate and collect relevant information, to sort, classify, sequence, compare and contrast, and to analyse part/whole relationships.

Reasoning skills

These enable pupils to give reasons for opinions and actions, to draw inferences and make deductions, to use precise language to explain what they

think, and to make judgements and decisions informed by reasons or evidence.

Enquiry skills

These enable pupils to ask relevant questions, to pose and define problems, to plan what to do and how to research, to predict outcomes and anticipate consequences, and to test conclusions and improve ideas.

Creative thinking skills

These enable pupils to generate and extend ideas, to suggest hypotheses, to apply imagination, and to look for alternative innovative outcomes.

Evaluation skills

These enable pupils to evaluate information, to judge the value of what they read, hear and do, to develop criteria for judging the value of their own and others' work or ideas, and to have confidence in their judgements.

(DfEE, 1999: 22)

The National Curriculum for Design and Technology scheme of work also includes a further statement about thinking skills and how they can be used in Design and Technology. They state that thinking skills can be extended in Design and Technology by using;

Problem-solving and thinking skills

In design and technology, children's problem-solving and thinking skills are best developed by giving them opportunities to:

- *Identify and use effectively relevant sources of information;*
- *Work collaboratively with others to solve problems;*
- *Evaluate products.*

(DfES, 2000b: 8)

There are also similarities between the Design and Technology and Information and Communications Technology schemes of work regarding problem-solving and thinking skills.

The Information and Communications Technology scheme of work says;

In ICT, children's problem-solving and thinking skills are best developed by giving them the opportunity to:

- *Model real situations;*
- *Investigate solutions to problems when working with ICT;*
- *Identify, and then use effectively, relevant sources of Information;*
- *Work collaboratively with others to solve problems.*

(DfES/Becta, 2000a: 6)

It is to encourage this transferability of skills and knowledge that CALs promote study and investigation within authentic contexts; but the ability to increase the transference of knowledge through thinking skills by the use of CAL is not totally technology reliant. The process is dependent upon the teacher and their specific use of the technology (Becta, 2002a; Ping Lim, 2002; Wegerif, 2002; Jedeskog and Nissen, 2004; DfES, 2005). The DfES/Becta (2003c) report on pedagogy also highlights the fact that the raising of attainment is entirely dependent upon the way that the teacher;

...selects and organises ICT resources, and how this use is integrated into other activities in the classroom and beyond.

(DfES/Becta, 2003c: 4)

The DfES/Becta (2003d), Higgins (2003), Passey (2003) and DfES (2005), also acknowledge similar findings. Indeed DfES/Becta (2003a:10) report that "... pupils certainly learn something from integrated learning systems..." and;

...generally something positive happens to the attainment of pupils who make (relatively) high use of ICT in their subject learning...

(DfES/Becta, 2003d: 3)

DfES also reported that research shows that if;

...teachers provide opportunities for pupils to carry out in-depth investigations with appropriate modelling environments then they (pupils) can reach higher levels of abstraction and competency....

(DfES/Becta, 2003a: 26)

2.7 Information or Learning: Exploration or task

The use of computers in learning is quickly becoming embedded as a part of the wider curriculum, especially in Design and Technology (DfES/ Becta, 2003d; QCA, 2004; DfES, 2005). There has been a significant shift in the position of ICT; it now occupies a central position in the learning agenda in schools, along with developments in the curriculum. This has brought about not only a significant increase in the provision of ICT facilities but also a fundamental shift in the role of ICT in education (Colley and Comber, 2003). The design of task-based systems, Human Computer Interaction (HCI), and educational or Computer-Mediated Learning systems (CML) has both similarities and differences. They both attempt to make the system appealing by engaging and motivating the user. Higgins (2003) and Becta (2004) advocate that the increase in attainment by pupils using ICT is because they "...spend more time working at or practising the skills being studied and tested" (Higgins, 2003: 8).

In a good design there should be tasks at an appropriate level as well as rapid and appropriate feedback for the user (Higgins, 2003: 10). The dissimilarities of HCI and CML are in the type of cognitive interaction; in the HCI it is the minimising of the cognitive challenge that is important, whilst in CML it is the cognitive interaction, which should be variable and appropriate to user ability, which is a basic function of the system (Quinn and Wild, 1998). A fundamental need of both systems is that the operating system is as transparent as possible to

ensure navigation, interaction, attention and perception. DfES (2005) suggest that one way to ensure this is to work more closely with the designers of computer games.

The task-based systems are designed for long-term use, whilst computer-mediated learning systems are expected to become obsolete when the learner has achieved the desired learning goals of the system. From their early beginnings in the 1980's USA educational software was based upon a behaviourist or quasi-behaviourist view of learning (DfES/Becta, 2003b). Howard (2000) sounds a cautious note over commercially produced materials for learning. She feels that the development of appropriate materials needs to be accelerated, whilst still ensuring that there is no dominance from large corporations, especially US ones, where issues about language and cultural sensitivities could be an issue. Indeed the DfES (2005: 28) suggest that they will;

...stimulate innovation by encouraging the development of highly interactive software, drawing on the expertise of the games industries ...to shift the focus from presenting content to engage learners to productive learning activities.

Learning, in schools, has been viewed as being the completion of a task, which is somehow sufficient to advance knowledge (Scaramalia and Bereiter, 1989). To reach a higher level of involvement pupils need to be asking how the task advanced their understanding and what do they understand that they did not understand before. Scaramalia and Bereiter's use of computer-based learning systems engages pupils in collaborative learning where discussion aids understanding, information is searched for and contributed to the communal data-base, misconceptions are addressed and findings published. Scaramalia and Bereiter (1989: 11) call this "...knowledge exploration ...rather than knowledge delivery". Orlowski (2005: 1) suggests "The value of creativity, imagination and critical thinking over 'information' access is self-evident." Knowledge, therefore, becomes exploration-driven rather than task-driven.

Rashbass (2000: 82) suggests that learning should be made an adventure "...and to use heuristics as the key driver". The DfES (2005: 29) suggest that e-learning activities should "...support both skill learning and understanding". This is in-line with Wegerif's (2002) thinking earlier in this chapter. Holmes and Gardner (2006) sound a warning in that reliance only on e-learning which will result in a lack of face-to-face contact. They suggest that there should be a mix of e-learning and more conventional face-to-face learning in a classroom; a process entitled 'blended learning'.

DfES/Becta (2003a) discuss the changing focus of recent research which is shifting from trying to measure learning gains using computers, to that of the more explorative and problem-solving aspects of some integrated LA learning systems. It is more concerned with how these systems might improve learning outcomes rather than measuring the outcomes and in their greater effectiveness when compared to traditional methods of teaching.

The use of computers to aid learning and develop higher level thinking is well documented (NFER/Harris and Kington, 2002; Loveless, 2003a; Becta, 2004). ICT has a positive impact upon pupils' interest in and attitudes towards their school work (Ofsted, 2004; DfES, 2005). DfES/Becta (2003d: 9) report that;

...pupil ICT use and school ICT provision impact positively on individual pupil attainment and on overall school performance.

Pupil higher attainment was displayed by their better achievements at Key Stage tests (Becta, 2004, 2007). There is higher pupil engagement in learning activities and pupil response. They remained on task longer and were able to work more independently (Higgins, 2003; Passey *et al*, 2003; Becta 2007). Pupils had deadlines set and/or targets which they negotiated and met (NFER/ Harris and Kington, 2002).

Ping Lim (2002) talks of the socio-cultural (pupil collaborative support and working) approach to using a computer: this is when a computer is used by two pupils and social learning takes place as described by Vygotsky's Zone of Proximal Development (ZPD) (DfES/Becta, 2003c, 2003d; Higgins, 2003; DfES 2004c). Group Investigation (collaborative working) has been heavily researched in terms of "... its effects (*ICT*), addresses both academic and personal development goals, and gets impressive results" (Fullan, 1991: 185).

Fullan describes how effective Group Investigation raised pupil interest and achievement (without the use of ICT). If this can be achieved without the use of ICT then there must be a powerful case for collaborative learning using ICT, which has a greater information and presentation base. Frost (1998: 9) found that "...when they (*pupils*) worked together with a word-processor, they started talking with zeal, not the usual gossip."

There are further cautionary statements for not misusing ICT (Smeets and Mooij, 2001). Ofsted (2004: 32) also state that;

Successful practitioners do not use ICT just for the sake of using it. They ensure that the use of the technology enhances the quality of teaching and learning, where it does not, they make use of more traditional methods.

Further to this, they suggest that "...traditional teaching methods and e-learning can and should complement each other." (ibio: 9).

Open-ended problem solving is designed using real-life contexts; this engages the pupils and enables them to seek real-life solutions to the problem. By contextualising the problem it enables pupils' learning to be directly related to the real world (Hill, 1998; DfES/Becta, 2003c) and thus giving a deeper and extensive learning about their world (McRobbie *et al*, 2001).

Work prepared by the teacher was specifically targeted towards individual pupils thus personalising pupil learning and raising pupil involvement and attainment (DfES/Becta, 2003d; Becta, 2004). By personalising the learning the DfES (2005: 8) suggest that ICT could "...re-engage the unmotivated learner, and bring an authentic and challenging task within their grasp." That ICT could "...make the difference between the boredom of the learner who's always left behind, and the discovery that they can find their own way to progress." Many pupils have been reported as having higher expectations of themselves as well as their teachers having higher expectations of them (Passey, 2003). This is partly due to computers liberating pupils from mundane tasks and allowing time for higher order thinking of the results (NFER/ Harris and Kington, 2002; DfES/Becta, 2003c; Becta, 2004); also that pupils are motivated and want to participate (DfES, 2005).

The immediate feedback given to pupils allowed them to improve their performance as this was both non-judgemental and targeted (DfES/Becta, 2003c, 2003d; Becta 2004).

Fullan (1991: 186) reports on the powerful strategy for giving pupils more control of their learning. He discusses this 'empowerment' in terms of allowing pupils to "... regulate their own learning..." and "... utilize their intellectual resources". Becta (2002b) and the DfES/Becta (2003a) also suggested that pupils will engage, when given the opportunity, in intelligent discussion of their own learning when using ICT. Prawat (1989: 34) suggests that there are three levels of learning: 1) motivational dispositions, 2) learning strategies and 3) factual or conceptual knowledge. Each level is mediated by organisation (of knowledge or strategies) and reflection (on what students know and use it in a different way). Prawat (1989) believes that there are strategies that help students develop, organise, become aware of and access their own and others' knowledge.

... it involves thinking of the child as a total cognitive being, one who, when empowered, has access to a full range of intellectual resources and thus can respond proactively as opposed to reactively in various in-school and out-of-school contexts.

(Prawat, 1989: 34)

Pupils are also reported as saying that computers made learning enjoyable (DfES/Becta, 2003c, 2003d; Higgins, 2003; Ofsted, 2004). Pupils are stimulated to be active learners who gather information, summarise the information and discuss it with their peers (Smeets and Mooij, 2001; Becta, 2004, 2007).

There is an improvement in the presentation of work which enhances self-esteem (DfES/Becta, 2003b, 2003d). There are other positive outcomes from the effective use of ICT in the classroom such as: there is a positive relationship between the quality of ICT learning opportunities and the overall quality of learning in schools.

In particular, where ICT learning opportunities were good, there was a higher likelihood that the learning was good or very good.

(DfES/Becta, 2003d: 8)

Becta (2001), DfES/Becta (2002), Goodison (2002) and Higgins (2003) report similar findings. DfES/Becta (2003d) later established that at primary level there was a positive relationship between pupil behaviour and the quality of ICT learning opportunities with adequate ICT learning resources.

2.8 Teachers' Confidence

The Literature Review also shows that the teacher and their attitude towards ICT are the biggest influence for the success or failure of ICT in the classroom. Weak teaching and the

number of missed opportunities for support by ICT are widely reported (John, 2004; Ofsted, 2004, 2005c, 2005d; Scrimshaw, 2004). Robertson (2003) feels that teachers are not the only ones to blame for the lack of embedding of ICT in schools. He feels that ICT would have been embedded into classroom activities now had government sponsored training not failed to "... train, to manage and to resource" (Robertson, 2003: 325) both teachers and schools. Kennewell and Beauchamp (2003); Becta (2004) and Scrimshaw (2004) further suggest that teachers need time and support to develop their "... repertoire of ways of using these valuable tools" (Kennewell and Beauchamp, 2003: 6).

It is not only the time required becoming skilful at using a computer and its programs but also the time required to incorporate the suggested pedagogy into the existing curriculum. Becta (2004) and Holmes and Gardner (2006) acknowledge that teachers require time to develop these new learning programmes.

Its introduction can place significantly increased burdens on teaching staff in terms of the time commitment needed to develop or localize materials (at least initially).

(Holmes and Gardner, 2006: 32)

DfES/ Becta (2004c) also think there is a lack of teacher confidence due to insufficient time to 'develop'. There is conflicting evidence from Ofsted (2004) and HMI (2005e) who reported an increase in teacher competence and confidence with ICT, which was reflected in the quality of teaching in ICT lessons and in the effective use of ICT in other subjects. While in 2005, Ofsted (2005c) report that ICT is still underused. Ofsted (2005c) and Fletcher (2006) acknowledge that teachers are using ICT in their lesson preparation, assessment, administration and so on, but not using it effectively in their teaching because "... of insufficient training of the right sort" (Ofsted, 2005c: 6).

There does not appear to be an age issue with the use of ICT by teachers, although Becta (2004) reports a small number of respondents (1.8%), from its survey, as suggesting that there is an age issue with teachers' use of ICT within their teaching. The respondents suggest that older teachers are less likely to engage with the technology due to their advanced age. In their Literature Review Becta (2002) highlight the European Commission report that correlates age and use of the internet by teachers. The report states that teacher use of the internet falls as their age increases. Much of Becta's remaining literature suggests little or no correlation between age and ICT use by teachers.

To help teachers, Promethean (2006) have devised interactive resources which are aimed to raise teacher skills and confidence as well as deliver interesting, focused and successful lessons that are all inclusive. Ofsted further identifies that the New Opportunities Fund's aims to promote teachers' understanding of the pedagogical issues for the use of ICT was clearly not achieved and indeed were "...over ambitious..." (Ofsted, 2005d: 22). This, Becta (2004), Ofsted (2004) and Scrimshaw (2004) all feel that pedagogy still remains the single most pressing need to move ICT forward. The DfES (2005) acknowledge that further specific training, with pedagogical input, is required for practitioners and are going to make this a priority. DfES (2004c) also suggest that 'practitioners' includes Teaching Assistants. Becta (2004, 2007), Scrimshaw (2004) and Ofsted (2005c) acknowledge that many teachers were willing to embrace ICT into their teaching. DfES/Becta (2003d: 14) also report that;

Most primary teachers believed that ICT would enhance pupil learning and attainment, and often linked ICT to increased independence and confidence amongst learners.

Teachers, it would appear, are willing to improve their skills and knowledge regarding ICT, but they need more specific type of training if ICT is to be embedded effectively into the classroom.

2.9 Summary

ICT is not a panacea for enhancing pupils' learning on its own, as already reported. As Goodison (2002), Higgins (2003) and Scrimshaw (2004) suggest, it is a combination of teacher, pupil and computer used in an effective and appropriate manner that will improve pupils' learning.

There needs to be awareness of the pedagogical framework for working with ICT, where teachers become more pupil-centred. The teacher becomes a facilitator not the giver of knowledge so that pupils access various forms of knowledge and then coordinate and analyse it cooperatively both singly and in groups. This can best be achieved, for example, by using open-ended software where pupils input the data and then allow the computer to draw the graph, so that they have more time for the analysis of the data and thus higher level thinking. This ties in with the Design and Technology National Curriculum requirements for problem-solving which is transferable to other areas of the curriculum, although there is still a debate as to the most effective way of teaching and when to teach these skills. Closed software does have advantages in that it will speedily mark and give feedback on students' work without being critical of them. This has been shown to encourage and engage pupils far more than previously experienced in school as pupils now had 'ownership' of their learning and work. Pupils 'enjoy' working in this manner and it raises their expectations of themselves and their work.

The greatest aid to ensuring that ICT develops within a school is the encouragement and support of the headteacher and the senior staff. The leadership within the school should have a positive and encouraging attitude towards the use of ICT right across the curriculum.

The central government national training plan (NGFL) has had very mixed responses from a variety of different sources; indeed some organisations gave mixed messages regarding its achievements. Ofsted (2004) thought that the training was "...not fit for purpose" and "...over ambitious". It would appear that teachers are not very confident about how to use ICT, not sure about its pedagogy; nor the transferability of ICT into different subject areas. The Literature Review highlighted that training has been insufficient and there needs to be CPD to ensure that teachers keep pace with the ever increasing developments within ICT. It was suggested that teachers need time to adapt and develop their skills with the new technology that they are willing to embrace new technology when they see its potential.

The research methods used questionnaire and interviews to establish both qualitative and quantitative data. These research tools were used to establish local data and teacher and LA officer opinion regarding issues that were highlighted within this chapter. These research tools were felt to be the most appropriate methods for gaining such data and are discussed in the next chapter.

CHAPTER THREE

3. METHODOLOGY

3.1 Introduction

This study examines the impact of the use of Information and Communication Technology on the teaching of Design and Technology at Key Stage 2 as demonstrated through teacher pedagogy, pupil response and teacher support. The current legislation is quite clear with regards to the use of ICT in Design and Technology at Key Stage 2; that there are opportunities for:

- Word processing
- Graphics
- Data bases
- Spreadsheets
- Control.

Within each year group at Key Stage 2, ICT opportunities are identified in the majority of the units. These opportunities cover a range and application of different skills, understanding and interpretation of both data and processes. This requires teachers to be adept in the use of a number of different computer programs. The methodology had, therefore, to establish the extent to which ICT was being utilized in Key Stage 2 Design and Technology (complying with the legislation); the effectiveness of CPD; how ICT is was being applied; the ability of the teachers in being able to operate the programs; the pedagogy being applied by the teachers and lastly the reaction of pupils. The methodology has therefore to question and address the

totality of the classroom situation and look for trends arising from what is essentially an individual interpretation and experience.

3.2 Research Aims

The aims of the study (see section 1.8) are reiterated along with how the methodology has been designed to allow the aims to be addressed. The aims were to investigate:

1. the impact of ICT on teachers in Design and Technology;
2. issues affecting the use of ICT within the teaching of Design and Technology
3. to investigate the use of interactive whiteboards during the teaching of Design and Technology.

It is difficult to exactly assess the impact of CPD in Research Aim 1, when there was no previous assessment carried out. While reflection could add a further dimension, teacher confidence, skill and delivery should be an indicator. It was, therefore, important to collect evidence by employing a range of methods. Aim 2 was addressed by qualitative data supplied by the Design and Technology subject co-ordinators. The questions for the semi-structured interviews (discussions with ten subject co-ordinators) and focus interviews (two LA schools officers) were developed from the work of Hitchcock and Hughes (1995), Anderson and Arsenault (1998), Verma and Mallick (1999) and Cohen *et al* (2000) where they discussed research methodology.

To address Aim 1 it was necessary to contact all Key Stage 2 schools in both Local Authorities and post a questionnaire to the Design and Technology Co-ordinator (See appendix 1 for permission, 2 for contact letter and 3 for sample of questionnaire). The

questionnaire was designed to ascertain an overall picture of the effectiveness of Continuing Professional Development (CPD). It was based around pre-determined categories: Computer and program access; Teaching; Interactive whiteboards; Pupils; The National Curriculum and finally Teachers personal data. These six specific areas were designed to produce mainly quantitative data and limited qualitative data. Questions 1 – 9 were to establish the resourcing of computers, the types of computer programs used and the frequency with which computers were used in Design & Technology. Questions 10 – 13 looked at the opportunities for applying the programs and their group settings. Questions 14 – 17 were to establish the availability of interactive white boards and their function. Questions 18 – 23 were there to identify the teacher's 'Professional Judgement' as to the value of ICT in raising pupil involvement and achievement. Questions 24 and 25 were to establish teachers' awareness and understanding of where their computer programs assisted in delivering the National Curriculum schemes of work. The final section - Questions 25 – 31 was to include teacher information on gender, age, length of service, training undertaken and confidence. This data enabled inferential statistical analysis to be undertaken, using SPSS. The questionnaire was targeted specifically at the Design and Technology co-ordinator to establish an overview of their school provision, their personal interpretation of staff use of ICT and finally their personal details.

To collect data for Aims 2 and 3 and to establish issues affecting professional performance, it was necessary to make semi-structured interviews with a number of participating teachers. This was to also explore and confirm some responses in the questionnaire. The LA Officers were also provided with a separate opportunity to have a focus group interview. They were used as a validating mechanism to confirm the teachers' views and to also give an over-view

from an LA perspective. Data was collected from both the questionnaire and semi-structured interviews of the teachers' respondents.

3.3 Triangulation

Triangulation is defined by Cohen *et al* (2000: 12) as;

... the use of two or more methods (multiple) of data collection in the study of some aspect of human behaviour.

Many writers on research methodology strongly advocate the use of multiple methods of examining collected data from different perspectives (Hitchcock and Hughes, 1995; Denscombe, 1998; Cohen *et al*, 2000). Cohen *et al* define the aim of triangulation as being to;

...map out, or explain more fully, the richness and complexity of human behaviour by studying it from more than one standpoint and, in doing so, by making use of both quantitative and qualitative data.

(ibid, 112)

The use of quantitative and qualitative data can be complementary if controlled by a suitable procedural matrix (Denscombe, 1998; Cohen *et al*, 2000). This study uses a number of different research perspectives, where the participant conceptualises the research problem by observing it from differing viewpoints, as suggested by Denscombe (1998). These different research instruments were a survey (questionnaire) of all Key Stage 2 schools within two LAs; a set of semi-structured interviews with subject coordinator teachers; further focus group interviews with L.A. Officers. This enabled a more detailed insight into some of the data collected through the survey, presented an opportunity to try to verify and validate some of the information being presented. Combining methods in a single study will provide some

triangulation to validate the findings, particularly when the first method is used to corroborate the second method (Bryman, 1996; Greene *et al*, 2001).

3.4 Research Paradigm

A scientific research paradigm requires that a meaningful phenomenon has to be observable, verifiable and repeatable in the real world. This requires the use of a set of umbrella methods and models to resolve the research issues. An interpretive approach that used both qualitative and quantitative data was used to understand the phenomena. But Anderson and Arsenault (1998: 9) point out that;

Unless we can accurately describe our findings and observations objectively they will have little meaning for others and will be of no general use.

The paradigm relies on the researcher working in natural settings and being the major means of gathering data and interpreting it (Lankshear and Knobel, 2004).

A part of this research is an investigation into teacher pedagogy. The intention was to explore the effects through an interpretive approach, in order to attempt to understand the use of ICT and its effect on teacher pedagogy used within Design and Technology at Key Stage 2.

The philosophy behind the interpretive paradigm is described by Hitchcock and Hughes (1995: 98) who state;

Knowledge of persons can only be gained through an interpretive procedure grounded in the imaginative recreation of the experiences of others to grasp the meaning which things in the world have for them.

They further suggest that for more clarification of the phenomena it is the lived experiences of others, with an analysis of their thoughts and understandings, which is essential to the interpretation. The main purpose of this paradigm is to analyse the rich language that has been gathered through qualitative data techniques - but it is possible to use some quantitative data. All Key Stage 2 schools, in the two LAs, were first circulated with a questionnaire to establish:

- the extent, manner of usage and programs used for ICT in Design and Technology;
- how the above fit into the Schemes of Work;
- the subject co-ordinators' gender, age and length of service.

For the semi-structured interviews, the schools were chosen through participants who sent acknowledgement slips or notes saying they wished to further participate, the questions being developed from issues in the questionnaire (Hitchcock and Hughes, 1995; Verma and Mallick, 1999; Cohen *et al*, 2000). The volunteers were cross-referenced with the survey profile for gender, age and teaching experience, all of which closely followed the profile.

The LA officers were chosen as they represented the subject area of Design and Technology, Primary INSET, ICT and School Contact Officers.

3.5 Quantitative Aspects of the Research Design

The use of quantitative data would appear to be a valuable tool for collecting a range of information regarding a number of issues from a large sample. It would also generate statistical data to develop an analysis of the relationship and differences between specific variables (Denscombe, 1998; Verma and Mallick, 1999). Anderson and Arsenault (1998) describe a number of different forms that quantitative results can be reported in. Generally

quantitative data are recorded as results tables, which are integrated into the text (Cohen *et al*, 2000).

Using a mainly quantitative questionnaire appeared to be a useful way for collecting a range of data about PC and interactive whiteboard usage, teacher perception of their influence and various issues regarding staff. It would also generate sufficient data to develop an analysis of the relationship and differences between various specific variables (Brown and Dowling, 1998; Verma and Mallick, 1999; Cohen *et al* 2000). Variables such as participant's gender, age and confidence were examined. The quantitative data had the potential to indicate statistically some improvement in the behaviour and attainment of the pupils.

3.6 Qualitative Aspects of the Research Design

Verma and Mallick (1999: 27) describe the qualitative perspective as involving;

... the gathering of evidence that reflects the experiences, feelings or judgements of individuals taking part in the investigation...The main feature of qualitative research methods is that meaningful explanations of social activities require a substantial appreciation of the perspectives, culture and world-view of the actors involved.

The research instruments used by the qualitative approach were questionnaire, interviews, and personal experiences. Anderson and Arsenault (1998) define qualitative data as describing the situation while the researcher seeks to interpret their meaning within a particular context.

The qualitative methods employed in this research were: opportunities to express their views within a questionnaire, semi-structured interviews and focus group discussions. Other

qualitative documentary evidence included Ofsted reports, government statistics and LA statistics.

The qualitative research is more interested in establishing some understanding and reasoning behind individuals' actions, rather than generating statistical data (Brown and Dowling, 1998).

3.7 Evidence Trails

A variety of sources were required to guide the development of the research instruments. The QCA Schemes of Work were revisited as a source of identifying opportunities for the use of ICT in Design and Technology. The QCA Schemes of Work, whilst not always being specific, do identify opportunities where ICT can be utilised; greater creative experiences for pupils, including ICT opportunities, are now being promoted through 'Excellence and Enjoyment'.

This research firstly attempted to investigate the impact of NGL training on the use of ICT and its effect on teaching during Design and Technology at Key Stage 2 by the use of a questionnaire.

Secondly, during the more in-depth semi-structured interviews, reference was made to the QCA units of study and how they influenced the planning, the delivery of that unit and the use of ICT.

...pedagogic approach demonstrated discrepancies between their statements and their classroom practice which focused on computer skills rather than integrated learning intentions.

(Loveless, 2003a: 315)

3.8 Reliability, Validity and Generalisability

The issues of reliability, validity and generalisability (Brown and Dowling, 1998; Verma and Mallick, 1999; Cohen *et al* 2000) were considered at the outset of this research study. These terms are more associated with positivist rather than qualitative research which are more concerned with interpretation and exposition. This has led to the view that qualitative researchers' reliance on themselves as data collectors and arbiters has led to questions being raised about the reliability, validity and generalisation of the qualitative data (Hitchcock and Hughes, 1995).

Reliability is defined by Brown and Dowling (1998: 143) as "... the repeatability of the process." Cohen *et al* (2000: 117) states that reliability is to do with consistency and replicability over time for both instruments and respondents. Brown and Dowling (1998) also argue that, especially with qualitative data, there will be a need for selection which must be representative of the data generally. They further suggest that to ensure this happens that the data be represented in different forms "... possibly a degree of quantification." (*ibid*: 143). The qualitative data in this study has been represented as both selective subjective comments and a quantitative summary of their subjective comments.

Reliability has been addressed in the research study by relating the subjective interpretations clearly to other relevant and established theories and research studies. The use of multiple methods was employed in this research to confirm that the findings from the quantitative data corroborated the evidence provided by the respondents in the qualitative research. Documents have also been explored to further confirm the findings (Lankshear and Knobel, 2004).

'Validity' is a reference to how appropriately a test tests what it is supposed to measure (Brown and Dowling, 1998; Verma and Mallick, 1999; Cohen *et al*, 2000). A test must have reliability if it is to be considered valid. Validity is a requirement of both qualitative and quantitative research. Quantitative research can address the validity of its data by careful sampling, appropriate instrumentation and appropriate treatment of the data, while qualitative research can approach its data collection by honest, in-depth, richness and the scope of its data, the participants approached and the extent of triangulation and the disinterestedness or objectivity of the researcher (Cohen *et al*, 2000). Validity of the findings is enhanced if different data sources are used according to Hitchcock and Hughes (1995: 106).

The use of more than one method to collect data will result in different sorts of data. This will expand the picture which the researcher has to look at but will also show how an initial or hypothesis may be confronted from different angles.

The use of multiple methods, as used in this research, has been outlined in section 3.3. If the results all agree - concur, according to the given criteria, and then the data has more validity than if the judgement had been arrived at from using just one instrument. While the questionnaire was piloted and rewritten, the general findings of the more quantitative questionnaire were used to plan the overall framework of the questions used within the semi-structured interviews. The answers then formed the basis of the focus group interviews. The researcher has taken steps to ensure that as valid and reliable findings as possible have been achieved in this study. Firstly, the questionnaire, semi-structured interview schedule and focus group interview schedule were designed to utilise the two categories identified in the research aims; impact and use of ICT on teachers as shown in Design and Technology lessons and the impact of any other issues with using ICT in Design and Technology. Secondly the selection of questions came through relevant literature, research findings and colleagues as critical

friends (see section 3.2). Pilot studies were undertaken for the questionnaire, the semi-structured interviews and focus group questions.

The interviews were all taped and carefully transcribed to ensure accuracy of the data. Constant checking of the information from both the tapes and typescript was employed.

One of the main functions of research, according to Verma and Mallick (1999: 94);

...is to generalize the factor or the variable relationship so that they may be applied outside the laboratory to a wider population.

Surveys have an appeal for generalisation within given parameters; they have large data banks that can support their findings and an ability to establish a degree of confidence in its findings (Cohen *et al*, 2000). The researcher is responsible for providing the description of generalisability. Judgement of the information and the transferability to other applications of that information lie with the reader and, therefore, the generalisation to other situations. The evidence which has been collated within this thesis, although regional, is based within the national context and therefore could be more generally applied to other classroom situations, schools and LAs.

3.9 Ethical Considerations and the Practitioner-Researcher

The researcher has an ongoing relationship with some of the schools in one of the Local Authorities that are involved within the research. The researcher's institute is in partnership with one of the LAs for student teacher placements, but this does not cause any conflict of interest or jeopardise the research findings as the schools used for the semi-structured interviews were not previously visited by the researcher.

3.9.1 Ethical Considerations

Within educational research there has been a great deal of discussion and debate about the ethical issues that face researchers in general and ethnographical researchers in particular.

(Burgess, 1989 cited Verma and Mallick, 1999: 146)

There has been growing awareness, in recent years, the issues involved in research and of the need to meet the obligations of those involved in, or affected by, the investigations (Anderson and Arsenault, 1998; Cohen *et al*, 2000; Lankshear and Knobel, 2004). Difficulties with ethics could arise from a variety of different sources. They could arise from: the nature of the research; the context for the research; procedures to be used; methods of data collection; the nature of the participants; the type of data collected and what has to be done with that data.

Officers for each LA were contacted and visited to discuss the research paradigm, its procedures and any ethical implications. Consent for the survey, staff interviews and observations were granted subject to headteacher approval at selected visited sites. It was also emphasised that all participation was voluntary and withdrawal could be at any time. None of the participants, their school or their pupils has been named in the research and care has been taken to ensure that identification of any party was improbable (Verma and Mallick, 1999; Cohen *et al*, 2000; Gall *et al* 2003).

3.9.2 Practitioner-Researcher

Hargreaves (1996 cited in Verma and Mallick, 1999: 69) thinks that;

...Practitioners and policy makers must take an active role in shaping educational research as a whole...

McNamara (2002) refers to educational evidence-based practice as still being in an 'embryonic' state. As referred to in section 1.6, the researcher is a tutor for Initial Teacher Education. Brown and Dowling (1998) feel that educational practitioners need to move out from their professional practice and into educational research. This will generate the dialogue between research and practice that is necessary for their mutual development. McNamara (2002) ponders on how evidence-based practice will inform teaching and what effect it will have upon the teaching profession. This development is necessary as public funds are spent on the increasingly elaborate education system, and these funds must be seen to be being spent wisely. The education system is aimed at educating all children in a more and more complex society into which they can contribute both financially and socially.

The quantitative aspect of the research was done through a postal questionnaire, which was administered by the researcher. This involved both the posting out and receiving of replies. To try to increase the number of returns, total anonymity was assured - although some replies contained compliment slips or phone numbers for further contact. A second letter asking for replies was sent four weeks after the initial questionnaire to encourage a higher return.

Observer bias is a strong possibility with descriptive methods of research and especially with interviews and observations (Borg and Meredith, 1989; Bell, 1999; Verma and Mallick, 1999). A serious possibility, while not being overtly bias, is that sometimes observers are unaware of their body language, the tone of their voice or their disposition towards the participant. Complete objectivity should be the intention of the observation or interview (Bell, 1999). Borg and Meredith (1989) suggest that the main sources of this unwitting and unconscious observer bias could be by having leading questions into interview guide; observer or

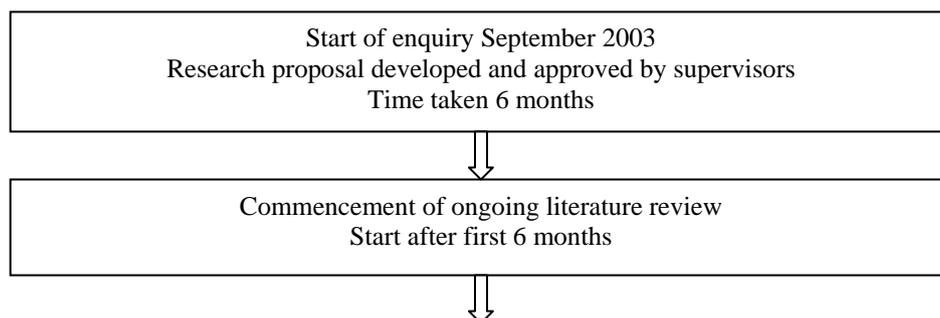
interviewer using a recording method which permits their bias or expectations to be included; recording of behaviour allowing for inferences from the observer/interviewer; questions that are threatening, embarrassing or annoying for respondents thus giving rise to false or unsatisfactory replies or the researcher knows the expected outcomes of the research. (Adapted from Borg and Meredith, 1989: 188-9).

To minimise researcher bias in the interview, schedules were piloted and the results analysed and discussed with a critical friend. The interviews were taped and the participants informed that the tapes and transcripts would be used only for the purpose of this research. All the participants were unknown to the researcher. The interviews were conducted at the participants' choice of venue. The meetings were friendly but businesslike. No prompts were offered and the researcher tried to remain neutral at all times.

The researcher acknowledges that there could be effects on the participant just by the researcher being there (Gall *et al*, 2003).

3.10 The Research Process

Figure 7 indicates the steps taken to ensure a logical progression as suggested by Bell (1999), Verma and Mallick (1999) and Lankshear and Knobel (2004).



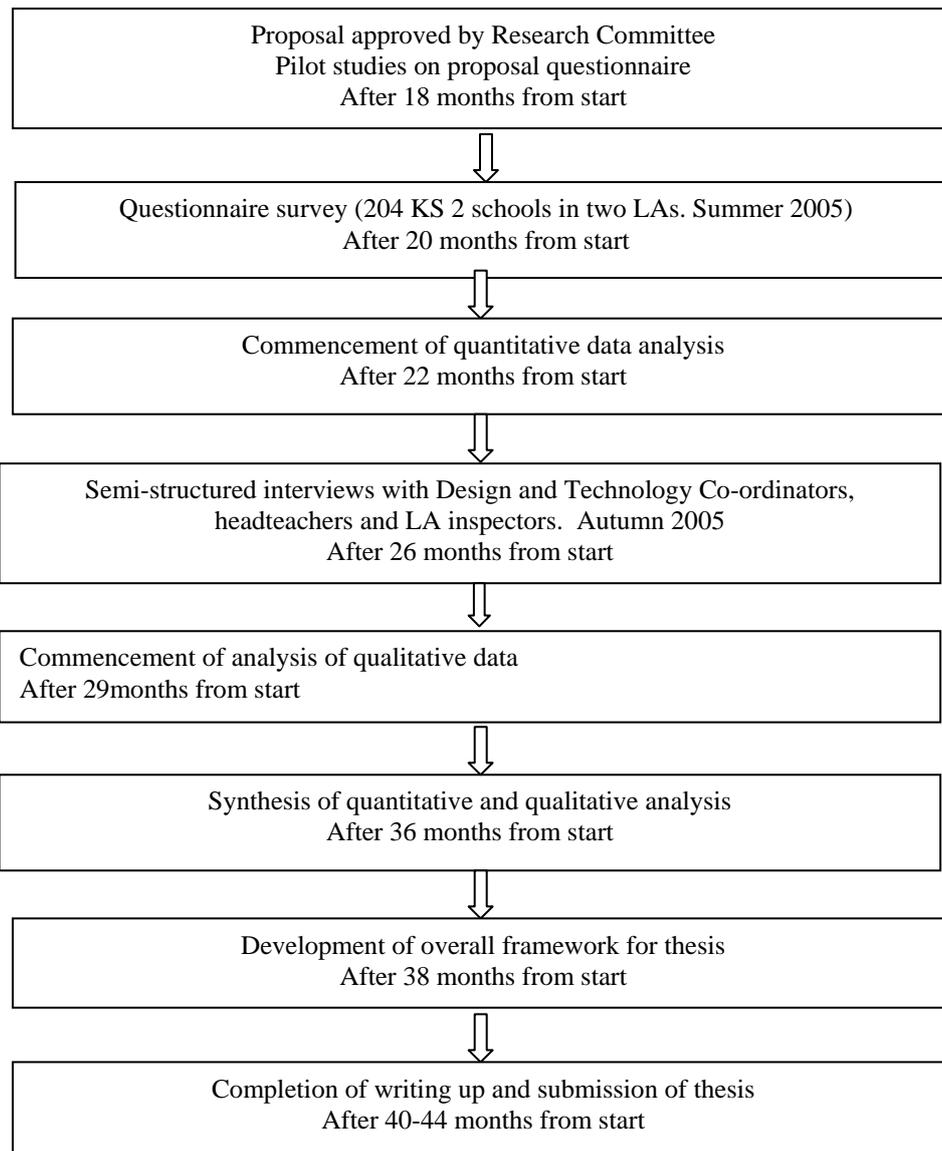


Figure 7 Organisation Chart for the Research

3.11 Methods of Data Collection

3.11.1 Questionnaire

Munn and Drever (1999: 1) say;

...questionnaires are a popular way of gathering information. ...postal questionnaires are by far the cheapest way of gathering information from hundreds or thousands of people.

The researcher considered a self-completed postal questionnaire to be the most effective method of reaching the target audience. A self completed questionnaire was chosen so that an overall perspective might be gained regarding ICT being used in Design and Technology lessons. Many research writers highlight the problem of a low response from postal questionnaires (Brown and Dowling, 1985; Bell, 1999; Verma and Mallick, 1999). Indeed Moser and Kalton (1971: 267-8) point out;

Non-response is a problem because of the likelihood – repeatedly confirmed in practice – that people who do not return questionnaires differ from those who do!

It was crucial to develop valid questions that clearly identified the general information required to give data to support the aims of the research (Anderson and Arsenault, 1998). The questions were devised to enable them to be computer processed using Statistical Package for the Social Sciences (SPSS), although Moser and Kalton (1985) do not advocate using a computer package for cases of 100 – 200 as there is, they say, very little advantage over pencil and paper. Brown and Dowling (1998: 103) advise;

In general, you would be better advised to make use of computer facilities, such as SPSS or a spreadsheet, for your statistical work.

The majority of the questions were closed while some had a multiple choice, as well as many answers being stated as a quantity. It was intended that the data generated would be used to inform the semi-structured interviews. The researcher is well aware of the limitations of questionnaires as outlined by academic writers. These are mainly: technical issues; ambiguity of the wording; respondents not answering honestly and the researcher's preconceptions being

incorrect. To limit, and wherever possible reduce, these possibilities whilst still remaining realistic, steps were taken to minimise these by the use of a pilot study, which is referred to in section 3.12. There was also the fact that teachers are very busy. Having to fill in a lengthy questionnaire which requires a great deal of writing would stop them from filling it in. Therefore a more simple recording method with the opportunity to expand if the respondent wished, was devised.

3.11.2 Semi-structured Interviews

Bell (1999: 135) says that the advantage of an interview is;

...its adaptability. A skilful interviewer can follow up ideas, probe responses and investigate motives and feelings, which a questionnaire can never do.

Semi-structured interviews should include a list of pre-prepared questions, which is only a guide, and a follow up with relevant comments for the interviewee to respond to. This allows for greater elaboration of emerging themes in the course of the interview, rather than restricting both the interviewer and the interviewee to a schedule (Cohen *et al*, 2000). The researcher can compare different responses to the same questions, while Lankshear and Knobel (2004: 202) say;

...at the same time remaining open to important but unforeseen information or points discussed.

This would allow for the generation of further qualitative data which could be used to enlighten and inform the researcher. This would be done through a two-way dialogue between the interviewer and the interviewee, which is not restrained, or tightly restricted (Borg and Meredith, 1989; Hitchcock and Hughes, 1995; Verma and Mallick, 1999). By probing the

interviewee's responses a deeper understanding can be gained. The semi-structured interview is not intended to be a re-run of the questionnaire but rather an opportunity to expand and gain further insight of the data already gathered. Verma and Mallick (1999) strongly suggest that the design for an interview schedule should not be drawn up until the questionnaire has been analysed. The researcher took this advice and analysed the questionnaire before designing the semi-structured interview schedule.

Fowler (1993) suggests that there are five aspects that the interviewer should try and standardise namely;

1. the way the research objectives and tasks are presented;
2. the way questions are asked;
3. the way inadequate answers are further challenged;
4. how the answers are recorded;
5. the way interpersonal aspects of the interview are dealt with.

The schedule was designed to include both primary and possible secondary questions to try and standardise the interviews while still striking a balance between consistency and freedom.

Cohen *et al* (2000: 267) suggests that during the semi-structured interview there should be an empathy with the "...subject's theory of everyday life that takes account of the relevant features of interviews." A non-threatening interpersonal approach between the interviewer and interviewee is vital for semi-structured interviews. The circumstances of the interview can affect the answers of the subject. They may not be as full as the interviewer wished, be minimal or even be non-existent. Hitchcock and Hughes (1995: 159) comment that;

Qualitative researchers point towards the importance of the establishment of rapport, empathy, and understanding between interviewer and interviewee.

The semi-structured interviews were the foundation in this study from which issues would be investigated in the focus group interviews. Semi-structured interviews can be the main line of enquiry or supplement other forms of data collection (Hitchcock and Hughes, 1995; Bell, 1999).

The same six similar categories, used in the questionnaire, were employed in the semi-structured interviews. They were 1) Teacher awareness of ICT; 2) Teacher awareness of the benefits of using ICT; 3) Programs; 4) Interactive White Boards; 5) Training and 6) The Future. This was to ensure validity and reliability.

3.11.3 Focus Group Interviews

The use of focus groups is growing in educational research (Anderson and Arsenault, 1998; Cohen *et al*, 2000; Lankshear and Knobel, 2004). The benefits of focus group interviews are their;

...relative low cost...(they) provide quick results, and ...can increase the sample size of qualitative studies by interviewing more people at one time.

(Marshall and Rossman, 1999: 115)

Anderson and Arsenault (1998: 200) go further and state that it gives;

...results in a deeper, more insightful, discussion...the focus group elicits a unique type of in-depth qualitative data which could not be obtained as efficiently any other way.

One more advantage is that the researcher is not leading the discussion. The researcher may have a small number of questions to ask the group but the group generate and drive the discussion. The group can consist of any number of participants, usually between six and twelve but a lot less when interviewing pupils. Anderson and Arsenault (1998) argue that focus groups work because:

- They provide a natural and relaxed setting;
- Both positive and negative comments are shared;
- The participants have commonality;
- Several people are involved at the same time

Focus groups are also being used to provide a basis for evaluation and analysis of other data already collected. This was particularly important as it would help to highlight any of the practitioner-researcher bias during previous data collection as referred to in sections 1.6 and 3.9.2. A further advantage of using a focus group interview was to clarify any conflicting views between the two LAs and their officers. The focus group interview was used to triangulate information and data previously gathered and to also gain further understanding of that qualitative data. Only one focus group was used during the data gathering, even though Anderson and Arsenault (1998) advise that one is not sufficient to validate the data. This was due to the fact that the Focus Group consisted of one of the LA's Inspector for Design and Technology and a Schools' Contact Officer and the other authority's Advisor who had responsibility for ICT and primary INSET. The reason that only two people were group interviewed, as opposed to Lewis (1992 cited in Hitchcock and Hughes, 1995) who recommends between six and nine respondents, is the difficulty in getting a number of senior LA officials to agree on a time and date to be interviewed. It took two months to get just two to agree a date! As the two interviewees are senior officials, they should be aware of their LA policy for their brief. Between their particular briefs, while differing, the issues highlighted in the semi-structured interviews could be covered. Lewis (1992) further argues that there are four research-based reasons for using focus group interviews namely;

- *To test a specific research question about consensus beliefs;*
- *To obtain greater depth and breadth in responses than occurs in individual interviews;*
- *To verify research plans or feelings;*

- *To enhance the reliability of interviewer responses.*

The reason that a focus group interview was held was to ensure that the semi-structured interview responses were reliable. Focus Interviews have now become common practice in educational research to triangulate and support previous data (Denscombe, 1998; Cohen *et al*, 2000; Robson, 2002). By acting as the lead, the researcher could cover the issues raised by the semi-structured interviews and obtain a deeper and wider understanding of those issues.

3.12 The Pilot Studies

Pilot studies are done for a number of reasons. Firstly to check that all questions and instructions are clear, secondly to enable the researcher to remove any items that does not generate usable data or any obstacles within the survey (Brown and Dowling, 1998; Bell, 1999; Cohen *et al*, 2000). Attention is also paid to the order of the questions, the division of the questionnaire into sections and the format of the questionnaire. It can alert the researcher to omissions or unanticipated answers in multiple choice or ranking questions. It will also give an insight as to the length of time taken to complete the survey. The pilot test subjects were drawn from the Design and Technology co-ordinators in primary schools who were not involved in the research, thus ensuring a match of population for the main surveys (Brown and Dowling, 1998). Two small pilot studies were carried out within this research. It was considered important that a test pilot be done on the questionnaire, as this was going to be posted out and be self-administered. Anderson and Arsenault (1998: 179) comments upon piloting surveys by saying;

It is always difficult to criticize your own work and in developing questionnaires it is essential to obtain comments from a least a small group of the intended respondents.

The pilot study highlighted areas that required further revision and modification to the questionnaire design. Secondly, a small pilot study was carried out to test the interview schedule for the Design and Technology co-ordinators. This was to enable the interviews to be appropriately carried out.

3.12.1 Questionnaire Pilot

The piloting of the questionnaire was principally to increase the reliability, validity and practicability of the questionnaire. Oppenheim (1992: 48) states;

...everything about the questionnaire should be piloted; nothing should be excluded, not even the type face or the quality of the paper.

The key issue is that the researcher tries to see the questionnaire through the eyes of the respondent. Bell (1999: 128) suggests that the following questions are asked of the respondent regarding the questionnaire.

1. *How long did it take to complete?*
2. *Were the instructions clear?*
3. *Were any questions unclear or ambiguous? If so which and why?*
4. *Any objections to answering any of the questions?*
5. *In your opinion, has any major topic been omitted?*
6. *Was the layout of the questionnaire clear/ attractive?*
7. *Any comments?*

This advice was followed with the researcher's pilot questionnaire which resulted in a number of revisions being made to the final draft (See Appendix 3). It took a number of drafts to get the questionnaire ready for piloting. These were trialled on colleagues, teachers and friends who acted as critical friends during this development period. A coding scheme needed to be

devised so that the data could easily be converted into a suitable form for computer analysis. This, Verma and Malick (1999) suggest, should be done at the post-pilot stage to check whether the scheme works or not.

The self-administered questionnaires were piloted on a small sample who matched to the population who were going to take part in the main survey (Borg and Meredith, 1989; Cohen *et al*, 2000). This group of five primary teachers were known to the researcher and approached for their assistance in the piloting of the questionnaire. These pilot questionnaires were not done anonymously as feedback and discussion was required from the respondents. By not being anonymous the researcher was able to contact the 'guinea-pigs' by telephone to discuss their opinions regarding the data collection instrument. Comments were written on the returned questionnaires regarding understanding of some questions, ease of answering, lack of choice and unanswered questions. During the telephone conversations respondents were asked why certain questions were left unanswered, how long it took to complete the questionnaire and their opinions on the wording of the individual questions. A check of the preliminary data was undertaken to ensure that the data was what was required for the research.

The piloting survey resulted in some changes being made to the wording of some questions and the choice of answers increasing in some instances. Some of the questions now also appear to cause uncertainty as to whether they are to be answered personally or are they about the school. This could jeopardise the validity of the data.

3.12.2 Semi-Structured Interview Pilot

The semi-structured interview questions arose from the replies from the questionnaire. (see Appendix 4) . The original questions were piloted with three primary teachers who were not involved in the main study. This gave the researcher an opportunity to practise his semi-structured interview techniques. Robson (2002: 291) also suggests that the interviewee can comment on “...your performance as well as on the interview schedule.” The interviewees were contacted and asked if they would be prepared to take part in the pilot, which they agreed to do. They were visited; one in their home, one at their school and the third by telephone.

In the light of the responses it was necessary to amend some of the wording of the questions to make them more ‘teacher friendly’; also supplementary questions were added in case the interviewees needed assistance or clarification for the questions (King, 2006b). (See Appendix 4 for final revised version of ‘Semi-structured Interview Schedule for Design and Technology Teachers).

The final version of the interview schedule was piloted on three different primary teachers who were not a part of the initial pilot interviews. They were contacted and asked if they would also take part in the piloting of the schedule, which they all agreed to do. Two of the interviews were done by phone and one by visiting the person in their school. The feedback from the interviewees indicated that no amendments were required to the questions.

3.13 Sample

There are many methods for sampling and the collecting of data from that sample: opportunity sampling, theoretical sampling and random sampling to name but three (Brown and Dowling, 1998; Cohen et al, 2000). Deciding who was to be part of the sample and how large that sample would be was one of the important issues in this aspect of the research study. There can be no generalisations regarding the appropriate size of the research sample as this very much depends on the amount of time available to the researcher (Bell, 1999). Bell also suggests that other considerations have also to be taken into account, variables such as the purpose of the investigation, the total size of the population and the research instruments to be utilised. A well-chosen sample seems more important than its size; this should be more representative than a poorly chosen large one. For this research study a non-probability sample of teachers was taken using the 'stage sample' method. In this method Cohen *et al* (2000: 101) state "...It (*Stage sampling*) involves selecting the samples in stages, that is, taking samples of samples." The Data Collection (3.14) section outlines the method of selection for the data sample.

3.14 Data Collection

3.14.1 Step one:

Two Local Authorities that were local to the researcher's base were chosen on the basis that contacts with them had already been established and that permission to use their primary

schools would not cause a problem (See Appendix 1). The proximity of the LAs allowed for easy access for semi-structured interviews and focus groups.

All the 204 schools, within the LAs, were surveyed by means of a postal questionnaire. Approval was gained from the Headteacher for the appropriate member of staff to answer the questionnaire. This was done by sending an explanatory letter, as well as a letter to the teacher (See Appendix 2). The questionnaire was distributed to the Design and Technology Co-ordinator Key Stage 2 in the school, who it was felt, would have an overview of ICT used in Design and Technology as well as having staff data to contribute. The data was designed to be mainly quantitative but with some qualitative. This was to establish basic facts and figures within the LAs. The response rate was 68 questionnaires returned (33%). A follow up letter was sent to schools to increase the response rate (See Appendix 2). Cohen *et al* (2000: 263) suggest that "...A well-planned postal survey should obtain at least a 40 per cent response rate." It is recognised that a 33% return could call into question the validity of the data being collected. However, the statistics shown in Tables 1, 2 and 3 highlight that the sample was fairly representative of the teaching population in primary schools in England. The generalisability of the data is somewhat compromised owing to this low return.

Table 1 - Breakdown of gender and age in DfES Statistics

England	Thousands					
Nursery and Primary	20-30 Years	31-40 Years	41-50 Years	51-60 Years	61+Years	Total
Female	33.7	27.3	28	28.1	0.8	117.9
Male	3.7	5.3	3.5	3.2	0.1	15.9
Total	37.4	32.6	31.5	31.3	0.9	133.8
%	28	24.3	23.5	23.3	0.7	99.8

(Adapted from WWW.DfES 2004b)

Table 2 - Break down of gender and age in Questionnaire returns

Primary	20-30	31-40	41-50	51-60	61+	Total
Female	8	11	16	7	0	42
Male	2	8	6	9	0	25
Total	10	19	22	16	0	67
%	14.7	27.9	32.3	23.5	0	98.4

Table 3 - Questionnaire Respondents Gender

Gender	Count	%
Male	25	37.3
Female	42	62.7

The DfES figures in Table 1 are skewed more towards females as their figures also include nursery and Key Stage 1 teachers who are generally female. The researcher's figures are only based on Key Stage 2 teachers.

3.14.2 Step two:

The questionnaire was anonymous but a number of respondents' returns also included a compliments slip or an acknowledgement that they would be willing to pursue the research further. This resulted in ten co-ordinator teachers wishing to take part in the semi-structured interviews, six female and four male. This gave a 10% sample of which 62.7% were female and 37.3% male which was in direct proportion to the original sample (Table 3, 4).

Table 4 – Gender make-up for semi-structured interviewees

Gender	Count	%
Male	4	40
Female	6	60

There was a cross-section of experience in approximate proportion to the cross-section of the original sample (Table 5 and 6).

Table 5 - Teaching experience of Questionnaire Respondents - Gender Cross tabulation

Count

Teaching experience in years	Gender				
	Male	Female	Total	% Male	% Female
0-10	7	12	19	10	18
11-20	5	17	22	8	25
21-30	11	11	22	16	16
31-40+	2	2	4	3	3
Total	25	42	67	37	62

Table 6 - Teaching experience - Gender Cross tabulation of Semi-structured Interviewees

Count

Teaching experience in years	Gender				
	Male	Female	Total	% Male	% Female
0-10	0	1	1	0	10
11-20	3	2	5	30	20
21-30	1	2	3	10	20
31-40+	0	1	1	0	10
Total	4	6	10	40	60

A cross-tabulation of the ages of the questionnaire respondents and the semi-structured interviewees show great similarities between the groups (See Tables 7 and 8) especially up to the age of 40. From 41 to 50 years of age the percentages change around for male to female but the total is similar. There is a little disparity in the male 51 to 60 year old section between the questionnaire and semi-structured interviewees but there is greater disparity between the females in this section.

Table 7 - Ages - Gender Cross tabulation of Questionnaire Respondents

20– 30 Yrs old		31 – 40		41 – 50		51 – 60	
Male	Female	Male	Female	Male	Female	Male	Female
2	8	8	13	7	13	9	7
3%	12%	12%	19%	10%	19%	13%	10%

Table 8 - Ages - Gender Cross tabulation of Semi-structured Interviewees

20-30 Yrs old		31 – 40		41 – 50		51 – 60	
Male	Female	Male	Female	Male	Female	Male	Female
0	1	1	2	2	1	1	2
0	10%	10%	20%	20%	10%	10%	20%

Overall there is a great deal of similarity, statistically, between the two cohorts of interviewees, as there is with the DfES figures for the cross-section of nursery and primary teachers.

3.14.3 Step three:

A focus group interview was held was to ensure that the semi-structured interview responses were verified and a more global overview could also be gained. Focus Interviews have now become common practice in educational research to triangulate and support previous data (Denscombe, 1998; Cohen *et al*, 2000; Robson, 2002). By leading the focus group, the researcher, could cover the issues raised by the semi-structured interviews and obtain a deeper and wider understanding of those issues.

3.14.4 Step four: Focus group discussion

The questions for the focused interview were devised from the analysis of the semi-structured interviews. The questions were then piloted with three colleagues to act as critical friends. A slight amendment was made to the lay-out of the script, at a pilot interviewee's suggestion. This was to ensure that all the minor points to each of the three questions they were asked were not missed.

3.15 Data Analysis

3.15.1 Quantitative Analysis

Descriptive and inferential statistical analysis was completed through a SPSS package for the questionnaire. Careful preparation was made for the collection of the statistical data by ensuring that form design was compatible with the computer software. This was to ensure that there was a minimum chance of errors occurring when entering the data and that the data did not have to be re-categorised, as recommended by Robertson (2002).

The data were firstly coded and entered into SPSS, checks being made to ensure reliability. The rows were for individual responses to the questions, while the questions were recorded as the verticals. Robertson (2002) suggests that this is an ideal time to be able to immerse oneself in the data and to familiarise oneself with it, whilst at the same time begin to tabulate and interpret what is happening with the data.

Cross-tabulation of some of the frequencies was necessary to establish relationships, tendencies and occurrences within these particular pieces of data. This type of data is referred to as *inferential statistics* where inferences or conclusions can be arrived at from the data collected. These statistics aided the researcher in determining if there were any differences or connections between the independent variables such as gender, age, length of service or computer use. Multi-choice type scales were used in some of the questions: for example Question 28 which asked the approximate years of teaching experience.

3.15.2 Qualitative Analysis

The data for the qualitative analysis was obtained from the semi-structured interviews and the focus group interviews. Both sets of interviews were digitally recorded and electronically transcribed. This was a comparatively simple task, if somewhat time consuming, to understand and initially use the technology. Kerlinger (1973: 273) suggests that the semi-structured and focus group interviews should be used;

...to follow up unexpected results, for example, or to validate other methods or go deeper into motivation of respondents and their reasons for responding as they do.

3.16 Summary

Research into educational issues requires a number of different research methods and techniques. During this study a number of different sources for evidence were employed with the intention of ensuring a broad understanding of the issues involved. This complies with Robson (2002) who suggests that there is no overall consensus as to how to carry out research.

The use of multiple methods within the research study was employed so as to ensure validity and reliability whilst reducing the chance of bias. The types of instrument employed generated both qualitative and quantitative data from questionnaires, semi-structured interviews, focus group interviews as well as 'official' statistics, as and when it was appropriate for the study. The slightly lower return from the questionnaire (33%) from what Cohen (2000) suggests (Minimum of 40%) does put into doubt the generalisability of the findings. The data, nevertheless, does give an indication of teachers' awareness of the use of ICT in Design and Technology teaching. The questionnaire was for the Design and Technology coordinator to answer both as the coordinator and personally. More discriminating wording in the instructions could have been used to ensure which questions were 'school' and which were 'personal'. This ambiguity of the questionnaire could throw some doubt as to the data validity.

Bias and ethical procedures could have been an issue, so guidelines were implemented and adhered to, to ensure that the research method reduced such possibilities. The methods used for the qualitative and quantitative data analysis included SPSS, thematic and dilemma analysis from the questionnaire, semi-structured interviews and focus interviews and tabulated data from the questionnaire, interviews and 'official' statistics. The following chapter examines the quantitative data.

The questionnaire in the next chapter will seek to assess teachers' opinions about some of the issues raised in this chapter. The data will be both qualitative and quantitative giving both 'hard' and 'soft' statistics for analysis and interpretation. The areas covered will refer to the general data about the cross-section of the teachers in the questionnaire, types of programs used for teaching, the frequency and use of ICT, pupil reactions to ICT, reaction to NGFL

training given, National Curriculum and ICT requirements, pupil reaction to ICT, benefits or negative results of using ICT and other issues that teachers raise as concerns.

CHAPTER FOUR

4. ANALYSIS OF THE QUANTITATIVE DATA

4.1 Introduction

The questionnaire was designed to give responses that were both qualitative and quantitative as well as giving an opportunity to pass comment on certain questions which were perceived by the teachers as an issue. The data collected was to establish:

- 1) data regarding the cross-section of teachers
- 2) any commonality in the type and frequency of programs used by the teachers
- 3) what CPD had and was being given
- 4) teachers' understanding and implementation of the requirements for ICT in Design and Technology
- 5) the interaction of pupils with ICT
- 6) the benefits or otherwise of ICT and any other issues that concerned the teachers.

Data from the questionnaires responses gave the researcher the opportunity to use the SPSS package to give both descriptive and inferential statistical analysis. The questionnaire was designed to enable the relevant statistical outcomes and computer software to be in the form that was going to be easily accessed and down-loaded into the computer. As far as possible the data was entered as the original responses and did not have to be re-categorised.

The data was coded with the minimum of changes to the original variables. It was then entered into SPSS. Care and attention was given to the processing to ensure reliability.

The 'Variable View' used rows to indicate the individual questions, while their associated values were placed in the columns.

In the 'Data View' section, the rows and columns were used to cross-reference data, with the columns indicating an individual's response to all the questions and the rows indicating the variables available within the answer for each respondent. The mean, mode and median were given in some results to establish the standard deviation and enable a comparison with other available data.

4.1.1 Survey of Computer use in Design and Technology Lessons

This section will examine the questionnaire data regarding the use of computers in Design and Technology lessons. Areas covered in this sub-section will be:

- Are computers used in Design and Technology lessons?
- The frequency of computer use
- The number of computers available
- When computer skills are taught
- A comparison of teacher gender and the use of computers
- A comparison of teacher gender, teaching experience and age

These areas will be illustrated through tables and commentary regarding the data.

Table 9 - Are computers used for Design & Technology

		Frequency	Percent	Valid Percent
Valid	Yes	61	89.7	91.0
	No	6	8.8	9.0
	Total	67	98.5	100.0
Missing	System	1	1.5	
Total		68	100.0	

Table 9 indicates the number of schools, from the survey, who use computers during Design and Technology lessons. The data indicates that there are 91% of schools using computers during Design and Technology lessons. HMI and Ofsted (2002) state, as noted in the Section 2.1, that computers are becoming more effective for teaching and learning. The DfES (2005) also state, in Section 2.1, that computers have made a high impact in schools; this statement is well supported by Table 9.

Table 10 - Number of computers available for Design and Technology Lessons

N	Valid	66
	Missing	2
Mean		13.02
Median		15.00
Mode		16

In table 10 the mode shows, that in most cases, it is possible for half the class to be working individually on computers during Design and Technology (16 computers available) (Higgins, 2003; John, 2004; DfES, 2005) or it is possible for the whole class to be working in pairs on the compute in the Literacy Review Section 2.5. Mean, median and mode all show similar results (Table 10), which indicates that there is the capability for all pupils to use computers in Design and Technology lessons.

Table 11 indicates that 43.1% of teachers used computers occasionally in their Design and Technology lessons, while 41.5% used computers infrequently. In only 12.3% are computers used every lesson or frequently compared to just 3.1% that never used computers. This is supported by the results of tables 13 and 14.

Table 11 - Frequency computers are used in Design and Technology

		Frequency	Percent	Valid Percent
Valid	Every lesson	1	1.5	1.5
	Frequently	7	10.3	10.8
	Occasionally	28	41.2	43.1
	Infrequently	27	39.7	41.5
	Never	2	2.9	3.1
	Total	65	95.6	100.0
Missing	System	3	4.4	
Total		68	100.0	

Table 12 - When Computer skills are taught

		Frequency	Percent
Valid	During	6	8.8
	Before	14	20.6
	Both	40	58.8
	Total	60	88.2
Missing	System	8	11.8
Total		68	100.0

Table 12 indicates that ICT skills are taught before and during the Design and Technology lesson by 29.4% of schools, skills were taught before Design and Technology lessons in 20.6% of schools and only in 8.8% of schools during the Design and Technology lesson. Webb (2002), in Section 2.4 of the Literature Review, indicates that the majority of schools, in his opinion, are approaching the teaching of ICT skills in the correct manner, as he feels that ICT skills should evolve as a separate subject and then eventually be integrated into all subject areas. Indeed, he feels, that in later years ICT skills will not be taught as a self-standing subject. Table 12 would suggest that schools are moving in that direction.

Table 13 - Are computers used for Design & Technology - Gender Cross-tabulation

		Gender		Total
		Male	Female	
Yes	Count	21	40	61
	% within Gender	87.5	93	91
No	Count	3	3	6
	% within Gender	12.5	7	9
Total	Count	24	43	67
	% within Gender	100	100	100

Table 13 indicates that there are six teachers in the survey who are not using computers in Design and Technology lessons. Whilst the score includes three males and three females, pro rata there are more males than females not using computers, than females not using computers, in Design and Technology lessons (Tables 13). NFER (2004: 8) contradict this finding by saying that “...teachers’ gender has an effect on the degree to which they use ICT. Male teachers make more use of ICT than female teachers....”

Table 14 - Are computers used for Design & Technology - Gender Cross-tabulation

	Gender				Total	%
	Male	%	Female	%		
Yes	21	87.5	40	93	61	91
No	3	12.5	3	7	6	9
Total	24	100	43	100	67	100

Table 14 shows that within gender groupings the male non-users are 12.5% of the group, while the nonuser females are only 7% of their group. Table 14 also shows that 93% of the females surveyed were using computers in their Design and Technology lessons, while only 87.5% of males were doing so.

**Table 15 - Are computers used for Design & Technology?
- Age band Cross-tabulation**

		Age band				Total
		20-30	31-40	41-50	51-60	
Yes	Count	9	16	21	15	61
	% within Age band	90.0	84.2	95.5	93.8	91.0
No	Count	1	3	1	1	6
	% within Age band	10.0	15.8	4.5	6.3	9.0
Total	Count	10	19	22	16	67
	% within Age band	100	100	100	100	100

This was not what the researcher anticipated - in fact quite the reverse. A cross-tabulation of teacher age with computer usage was then made to investigate if age was a significant factor. NFER (2004: 8) state that "...there was little evidence to support the commonly held view that age affects levels of teachers' ICT use." Again there was a surprising result - in that those teachers who were more likely to have used computers during their own secondary school education and in the home (31 – 40 year olds), were 50% of the group who were **not** using computers in their Design and Technology lessons. (Table 15).

These unexpected results then made the researcher consider whether the result was influenced by teaching experience. A cross-tabulation between the use of computers in Design and Technology lessons and teaching experience also brought out some other rather surprising results. As teaching experience increased there was an increase in the use of computers in Design and Technology; the more experienced teachers are all using, to some degree, computers in their Design and Technology lessons (Table 16 and 17).

Table 16 - Are computers used for Design & Technology? - Teaching experience Cross-tabulation

	Teaching experience				Total
	0-10	11-20	21-30	31-40+	
Yes	16	20	21	4	61
No	3	2	1	0	6
Total	19	22	22	4	67

Table 17 - Are computers used for Design & Technology? - Teaching experience Cross-tabulation

			Teaching experience				Total
			0-10	11-20	21-30	31-40+	
Are computers used for D & T	Yes	Count	16	20	21	4	61
		% of Total	23.9	29.9	31.3	6.0	91.0
	No	Count	3	2	1	0	6
		% of Total	4.5	3.0	1.5	0	9.0
Total		Count	19	22	22	4	67
		% of Total	28.4	32.8	32.8	6.0	100

The teachers with 0 to 10 years teaching experience were 28.4% of the total respondents, yet they represent 4.5% of the 9% of teachers not using computers in Design and Technology lessons (Table 17). When teaching experience has risen to between 31 to 40+ years, all the teachers in this experience band say they are using computers in their Design and Technology lessons.

Table 18 indicates that there are only 1.5% older late entrants into teaching in both the 0 – 10 and 11 – 20 years teaching experience columns. Older late entrants are a possible factor explaining why less experienced teachers are not using computers in the Design and Technology lessons.

Table 18 - Age band - Teaching experience cross-tabulation

			Teaching experience				Total	
			0-10	11-20	21-30	31-40+		
Age Band	20-30	Count	9	1	0	0	10	
		% of Total	13.4	1.5	0	0	14.9	
	31-40	Count	8	11	0	0	19	
		% of Total	11.9	16.4	0	0	28.4	
	41-50	Count	1	9	12	0	22	
		% of Total	1.5	13.4	17.9	0	32.8	
	51-60	Count	1	1	10	4	16	
		% of Total	1.5	1.5	14.9	6	23.9	
	Total		Count	19	22	22	4	67
			% of Total	28.4	32.8	32.8	6.0	100

There appears to be no plausible reasoning for these results, but as Cullingford (2001) suggests in Section 2.1, new teachers tend to develop their own teaching style with experience and time. Webb (2002) also states in Section 2.4 that their teaching becomes more didactic. Didactic teaching is not suited to ICT use as described by Scrimshaw (2004) in Section 2.4. Moseley and Higgins (1999) also report in Section 2.4 that the most effective teachers, who tend to have higher ICT skills, can perceive the opportunities that ICT brings and therefore use it more in their teaching.

The results go against the ‘urban myth’, section 2.4, regarding ‘females and technology’ and older teachers not being interested, lacking confidence and not being ICT literate. The data contradict these ideas and require further research. Computers are being used in Design and Technology lessons but in varying degrees of frequency. Female teachers are using computers more in Design and Technology lessons than their male counterparts. There is an age group of teachers, with similar teaching experience, who are not using computers; older late entrants **did not** influence the result. Computer skills for pupils, according to the majority of respondents, are being taught both before and during Design and Technology lessons. There

are sufficient computers for pupils to use with class groupings that are in line with research recommendations.

4.1.2 The Use of Computer Programs

This sub-section will examine both Microsoft programs and other commercial programs as to their frequency of use during Design and Technology lessons. These alternative commercial programs are generally used to cover areas that Microsoft programs do not cover. The commercially produced programs are examined for similarity of usage to Microsoft programs. How teachers use both Microsoft and other commercial programs to assist in delivering the National Curriculum is also examined for their frequency and type of usage.

**Table 19 - Frequency of use of Microsoft Programs
- Teaching Experience Cross-tabulation**

		Teaching Experience				Total
		0-10	11-20	21-30	31-40+	
Every lesson	Count	0	1	0	0	1
	% of Total	0	1.5	0	0	1.5
Frequently	Count	0	4	3	0	7
	% of Total	0	6.2	4.6	0	10.8
Occasionally	Count	10	8	8	2	28
	% of Total	15.4	12.3	12.3	3.1	43.1
Infrequently	Count	9	7	9	2	27
	% of Total	13.8	10.8	13.8	3.1	41.5
Never	Count	0	0	2	0	2
	% of Total	0	0	3.1	0	3.1
Total	Count	19	20	22	4	65
	% of Total	29.2	30.8	33.8	6.2	100

Microsoft programs are standard on most personal computers; the questionnaire produced data as to the frequency of their use and the type of use of these programs by pupils and teachers. This result did not bring any great surprises (Table 19). The two highest frequencies were 'occasionally' and 'infrequently', with 'occasionally' being the higher in the 0 -10 and 11 - 20 Teaching Experience groupings at 15.4% and 12.3% respectively and slightly lower at 14% and 11% for 'infrequent'. In the 21 – 30 Teaching Experience group the highest result was for 'infrequently' at 13.8% and 12.3% for 'occasionally'. In the 31 – 40+ group the only frequencies recorded were 'occasionally' and 'infrequently' which were both 3.1%. There was a significant drop in usage for the frequencies either side of these two frequency bands in all age groups.

As many teachers have personal laptop computers (Section 1.6), funded through government initiatives and Personal Computers are used in schools by teachers, the researcher investigated which programs teachers used in their Design and Technology lessons.

From Section 2.4, Ofsted (2004) state that teachers are now becoming more discerning when using software packages. Indeed they are using more open-ended programs with their pupils. These packages are more pupil-centred, as described by Becta (2004, 2007) and Scrimshaw (2004) (Section 2.4). The questionnaire (Fig. 8 and Table 20) indicates that the open-ended programs of Word and Internet Explorer were the most used programs (71.9% and 69.4% respectively). PowerPoint, Publisher and Excel were only used moderately (38.7%, 35.5% and 27% respectively when rounding up the data), while Outlook was only used by 3.2% and Access was not used at all by any of the teachers. These findings were also substantiated by Table 21, which asked about Programs assisting in meeting the National Curriculum Schemes of Work. Internet Explorer was used by 38.2% of respondents, Word by 36.8%, Excel 25%,

Power Point 22.1%, Publisher 20.6% and Access not at all. The art program Colour Magic was used by 27% of the respondents to assist with delivery (Table 21).

Fig 8 – Teacher Use of Microsoft Programs Used in D and T Lessons

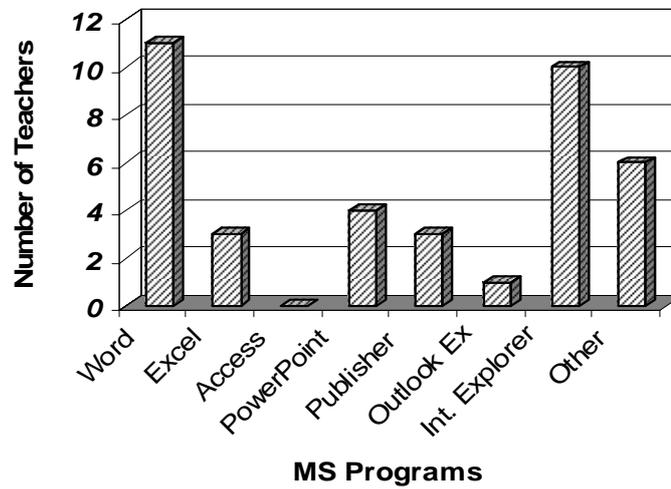


Table 20 - Teacher Use of Microsoft Programs

	Word		Excel		Access		PowerPoint		Publisher		Outlook		Internet Explorer	
	Count	%	Count	%	Count	%	Count	%	Count	%	Count	%	Count	%
Yes	46	71.9	17	27	0	0	24	38.7	22	35.5	2	3.2	43	69.4
No	18	28.1	46	73	62	100	38	61.3	40	64.5	60	96.8	19	30.7

Table 21 - Teacher Use of Computer Programs Used in Design & Technology Lessons

	Cases					
	Valid		Missing		Total	
	N	%	N	%	N	%
PowerPoint	15	22.1	53	77.9	68	100.0
Publisher	14	20.6	54	79.4	68	100.0
Word	25	36.8	43	63.2	68	100.0
Internet Explorer	26	38.2	42	61.8	68	100.0
Excel	17	25.0	51	75.0	68	100.0
Colour Magic	18	26.5	50	73.5	68	100.0

The Microsoft programs were in approximate ratio to previous data supplied by the respondents (Tables 20 and 21). The other programs used by teachers to help deliver the National Curriculum Schemes of Work were two art programs (Dazzle 15% and Paintshop 7%) and a data handling program (1st Workshop 19%) (Table 22). The art program, Colour Magic, does not appear in the results of Table 22.

Table 22 - Other Programs used to Assist with Delivering the National Curriculum

Programs	Valid	
	Number	%
Dazzle	10	15
Paintshop	5	7
First workshop	13	19

Microsoft Office programs do not cover ‘art’ programs (although Microsoft ‘Paint’ is available), so teachers use other commercial programs to supplement their delivery coverage which accounts for these commercial programs being included.

Table 23 - Frequency with which Microsoft programs are used

		Frequency	%	Valid Percent
Valid	Every lesson	1	1.5	1.6
	Frequently	10	14.7	15.9
	Occasionally	29	42.6	46.0
	Infrequently	13	19.1	20.6
	Very rarely	8	11.8	12.7
	Never	2	2.9	3.2
	Total	63	92.6	100.0
Missing	System	5	7.4	
Total		68	100.0	

Teachers are using Personal Computers regularly and also using open-ended Microsoft programs; Table 23 shows that the total of the ‘frequently’ and ‘occasionally’ categories is 57.3% of the usage time. Why then, are teachers using First Workshop and not using Excel for their data handling? This was the basis of a question during the semi-structured interviews.

Table 24 - Areas that Microsoft Programs Assist in Delivering National Curriculum Schemes of Work Statistics

	Planning		Assessment		Understanding	
	Count	%	Count	%	Count	%
Yes	12	18.5	4	6.2	26	40
No	53	81.5	61	93.8	39	60

The questionnaire examined the manner in which teachers are using Microsoft programs to assist them in delivering the National Curriculum Schemes of Work. Table 24 shows that there are 40% of teachers using the Microsoft programs to assist them in ensuring pupil ‘understanding’, while 18.5% of teachers use them for ‘planning’ and only 6.2% of teachers use the programs for ‘assessment’. This then raises questions for research as to why teachers are not using technology to assist them in their administrative duties as part of the government’s intentions for ‘computers for teachers’ was for technology to assist teachers in their administrative duties (Section 1.1).

Table 24 highlight a number of issues:

- Firstly, why is there such a low count for ‘Yes’ in all three areas?
- Secondly as planning and assessment are key to effective teaching, why is there such a poor response from teachers with in these areas?
- Thirdly, why was there such an overall poor response to the questions regarding the use of computers?

Indeed, one respondent felt that there were no programs available to help her with this task.

This raises an interesting area for further discussion during the semi-structured interviews.

Table 25 - The Type of Program Usage for Programs that Assist in Delivering the National Curriculum Schemes of Work

	Word Processing		Drawing/ Design		Control		Spreadsheets		Data Collection		Other		Primary Design	
	Count	%	Count	%	Count	%	Count	%	Count	%	Count	%	Count	%
Yes	43	70.5	46	74.2	32	51.6	24	38.7	27	43.5	3	4.8	4	6.5
No	18	29.5	16	25.8	30	48.4	38	61.3	35	56.5	59	95.2	58	93.5

In helping teachers deliver the National Curriculum Schemes of Work, Word at 71.9% is the most widely used application for computers, while Internet Explorer was second at 69.4% as shown in Table 20 (Pg 106). This is not supported by Table 25 which clearly indicates that ‘Drawing’ at 74.2% is used more than Word Processing at 70.5% and Control is only used by 51.6% of teachers (this is in line with what is reported in Section 2.4), Internet Explorer is not mentioned at all. (If this is the case how is ‘Control’ taught, that is a part of the Scheme of Work for Design and Technology at Key Stage 2? (DfES/QCA 2000b) [Section 2.1]). This could be explained by the fact that teachers are differentiating between the uses of their programs i.e. preparation and classroom use. Word and Internet Explorer could be heavily used in assisting with the planning, work sheets and resources for the National Curriculum Schemes of Work.

Table 26 - How the Internet is Used During Design and Technology Lessons

	Is the Internet used		Specific Information		Ideas		Reference		Other		Examples of Design		Competitions	
	Count	%	Count	%	Count	%	Count	%	Count	%	Count	%	Count	%
Yes	59	90.8	50	83.3	51	85	29	48.3	11	18.3	10	15.9	1	1.6
No	6	9.2	10	16.7	9	15	31	51.7	49	81.7	53	84.1	63	98.4

Table 26 highlights the fact that the internet appears to be heavily used at 90.8%, whilst ‘researching for Ideas’ accounts for 85% of teachers’ usage and ‘Specific Information’ at 83.3%. Smeets and Mooij (2001) report their research indicates (Section 2.5) that pupils are stimulated to be active learners by gathering, summarising and discussing information they

have collected. Yet Watson (2001) suggests that pupils are good at locating information but not at processing it (Section 2.5).

Table 27 - Direction of lesson influenced by Pupil Information from the Internet

		Frequency	Percent
Valid	Yes	51	75.0
	No	9	13.2
	Total	60	88.2
Missing System		8	11.8
Total		68	100.0

Could it be that teachers are allowing pupils to ‘discover/ research’ for data and information and then helping them to interpret that data, which will then influence what is happening in their lesson? It could be that teachers are beginning to radically change their teaching style as suggested in the Literature Review (Section 2.3) by Fabry and Higgs (1997 cited in Scrimshaw 2004). Indeed teachers could have reached that ‘critical stage’ of confidence and skill as suggested by Moseley and Higgins (1999) in the Literacy Review (Section 2.4) where they are beginning to develop their teaching pedagogy. This requires further investigation.

The data would suggest that Microsoft programs are being widely used, except for Access, during the delivery of Design and Technology lessons. It would appear that their frequency of use within Design and Technology lessons is in proportion to the experience of the teacher. The younger the teacher, the more frequently was their usage of Microsoft programs. Microsoft Word and Internet Explorer were the most widely used Microsoft programs during Design and Technology lessons, whilst Microsoft Access was not used at all. The other commercially produced programs used were mainly art packages and one data handling package. The drawing packages were more widely planned Design and Technology lessons than any other package, including all the Microsoft programs.

The data suggests that only a few teachers use ICT when planning and assessing, and only 40% of them use it to assist in aiding pupils understanding of the National Curriculum Schemes of work.

The data indicates that the Internet is heavily used for general information and ideas, which can in many cases influence, in many cases, the direction of a planned lesson.

4.1.3 Interactive Whiteboards during Design and Technology Lessons

Interactive Whiteboards (IWBs) are a relatively new piece of technology now entering primary education. This new technology is yet another piece of ICT equipment that the teacher has to learn to use. This sub-section will look at whether:

- Teachers use IWBs in a different manner during their lessons;
- There is a pedagogical change when using IWBs;
- The boards are ‘interactive’ for both teachers and pupils. The data will be examined to note whether teachers ‘allow’ pupils to use this new technology to assist in their learning.

Table 28 - The Usage of Interactive Whiteboards During Class Lessons and Design and Technology Lessons

	Is an interactive whiteboard used		Interactive W/B used in Design & Technology	
	Count	%	Count	%
Yes	54	81.8	46	69.7
No	12	18.2	20	30.3

Interactive Whiteboards are widely used at 81.8 % of schools (Table 28). Some of the respondents did indicate that Interactive Whiteboards were about to be installed or they were

waiting for training prior to use. This would indicate that there will shortly be wide spread availability of Interactive Whiteboards within primary schools.

What was highlighted by Table 28 was the difference between respondents who had and were using Interactive Whiteboards (81.8%) in their classrooms and the number that were using them during Design and Technology lessons (69.7%). The researcher anticipated that there would be a very similar response to both questions. This discrepancy in usage was a surprise. There are many different images and pictures available in the ‘gallery’ on the boards to assist in the Design and Technology lessons. Internet web sites can be projected on the board, with a further facility to annotate the text. Pupils can also see the IWB more easily than looking at a monitor screen. This area needs further investigation as to why there is such a drop in teacher usage of Interactive Whiteboards during Design and Technology lessons.

Table 29 - The Use of Interactive Whiteboards in Design and Technology Lessons

	Demonstration		Introduction		Ideas/ understanding		Information		Other		Other uses – small group	
	Count	%	Count	%	Count	%	Count	%	Count	%	Count	%
Yes	43	89.6	42	87.4	37	78.7	34	72.3	3	6.5	4	8.32
No	5	10.4	5	10.4	10	21.3	13	27.7	43	93.5	0	0

There was also an issue of how IWBs were being used in Design and Technology. There was a very close comparison between ‘demonstration’ at 89.6%, ‘Introduction’ at 87.4%, ‘Ideas/Understanding’ at 78.7% and ‘information’ at 72.3% (Table 29). More than half of the respondents (73.1%) were actively engaged with pupils using the boards (Table 30). This type of activity is supported by the Literature Review (Section 2.6) where Wegerif (2002) suggests that discussion aids learning. Within the same section there is also a suggestion that pupil problem-solving and thinking skills are improved by group discussion. Just under a quarter (24%) of respondents did not answer this question, even though the question asked whether

they had IWBs. It could be that IWBs are being widely used to support teaching and learning in the classroom; maybe they will be used more in Design and Technology when the teachers are more confident in using these boards. This was another area for further investigation during the semi-structured interviews.

Table 30 - Pupils Usage of Interactive Whiteboards during Design and Technology Lessons

	Do pupils use interactive W/B	
	Count	%
Yes	38	73.1
No	14	26.9

From the data it would appear that IWBs have been well received and used within the classroom. The data also highlights that the boards are being used interactively with students for a variety of teaching and learning reasons. There was no apparent reason why the boards were not being used as frequently in Design and Technology lessons as they are in other lessons. This would be further investigated as a part of a question for the semi-structured interviews.

4.1.4 New Opportunities Funded Training

The New Opportunities Funded training was seen by the government to be a way to increase teacher confidence, skill and use of ICT with the school setting (Section 2.4). The data will examine how that training was generally received by teachers. It will look at whether the training increased teachers' abilities with ICT, whether there was a gender difference in reaction to the training and in which areas teachers still feel they need more CPD.

**Table 31 - Teachers Receiving
New Opportunities Funding Training**

	New Opportunities Funded Training		NOF training helped your computer use	
	Count	%	Count	%
Yes	50	74.6	25	45.5
No	17	25.4	30	54.5

The number of teachers having New Opportunities Funded training was 74.6% of the respondents (Table 31). Yet out of that 74.6% only 45.5% found the training aided their computer use, while 54.5% found New Opportunities Funding training did not help them. This is in line with what Ofsted (2005b) and Becta (2007) reported in the Literacy Review (Section 2.8), where Ofsted (2005c) suggested that the training was insufficient and not "...of the right sort." Indeed they further support the teachers' views by saying that New Opportunities Funding training was "...over ambitious."

**Table 32 - Where New Opportunities Funding
Training has Aided Teachers**

	Confidence		Deeper knowledge		Want to know more		More skilful		Other	
	Count	%	Count	%	Count	%	Count	%	Count	%
Yes	18	69.2	14	56	8	32	13	52	1	4.5
No	8	30.8	11	44	17	68	12	48	21	95.5

The area that teachers gained the most from during the training was confidence (69.2%), followed by deeper knowledge (56%) and feeling more skilful (52%) (Table 32). In Section 2.4 of the Literacy Review, it was felt by Moseley and Higgins (1999) that teachers reach a critical point where their confidence and skill spurs them onto wanting to continue their computing development. In this survey there were 32% of teachers wanting to know more about computers and their use. Indeed the rationale behind the National Grid for Learning Programme (Section 2.4) was for teachers to integrate ICT-based skills and pedagogy into

their work and plan for further professional development (Section 2.4). Again this was raised the possibility of a gender issue. Section 2.4 suggests that some teachers use greater pupil knowledge to develop their own and consequently become more adventurous with their use of ICT in class. Table 33 illustrates that there is a mixed reaction from the teachers to the New Opportunities Funding training. Only 16.2% of males accepted that the New Opportunities Funding training assisted them in their computer usage, whilst 28.8% of female teachers felt it had. When examining the data regarding NOF training, the ‘no’ male teachers are 23.4% and ‘no’ female teachers are 30.6% of their gender total (Tables 33). Pro-rata, the male teachers have had less assistance from their NOF training than the female teachers. This is supported by results of the Literature Review (Section 2.4).

**Table 33 - NOF training helped your computer use
- Gender Cross tabulation**

% of gender total	Gender				Total	
	Male	%	Female	%		%
Yes	9	16.2	16	28.8	25	45
No	13	23.4	17	30.6	30	54
Total	22		33		55	

Table 34 - Other Areas In Which Teachers Feel they Need More Assistance

	Further Assistance		Cross-curricular		More training		Lack of confidence		Lack of equipment		Technical assistance		More time to understand programs		NOF a waste of time	
	Count	%	Count	%	Count	%	Count	%	Count	%	Count	%	Count	%	Count	%
Male	25	37.3	0	0	0	0	0	0	3	12	1	4	2	8	1	4
Female	42	62.7	0	0	3	8.3	2	4	3	7	2	5	4	8	1	2

The New Opportunities Funding training has left some teachers asking for further assistance in ICT (Table 34). From my questionnaire, 37.3% of males and 62.7% of females asked for further assistance with ICT (Q31 response to opportunity to choose ‘other’). This gave an overall total of 35.7% of respondents who felt they needed more assistance.

Ofsted (2005c), as reported in the Literature Review (Section 2.4), stated that teachers do need “...specific training.” The data suggests that teachers, especially males, were dissatisfied with NOF training. Indeed research bodies such as Ofsted (2004) and HMI/Ofsted (2002, 2005d, 2005e) also agree that the training was unsatisfactory. What teachers were asking for is more equipment and more time to get to know the technology. While technical support was also a high priority, especially for female teachers.

4.1.5 Further Assistance and Training

Table 34 further illustrates that the ‘lack of equipment’ (12% female and 7% male) and ‘more time to understand the programs’ (8% both female and male) are the two next biggest issues that the teachers identified as the areas they required the most help with, whilst technical support is asked for from 4% of male teachers and 5% of female teachers. DfES (2005) state that they consider that computers have not changed teaching and learning (Section 2.1). The Ofsted Report of 2005 (2005c) further states that ICT is still not being used effectively in Design and Technology lessons, but that this is due to insufficient ‘training’ of the right type (Section 2.5). This is underpinned by the research of Kennewell and Beauchamp (2003), Becta (2004) and Scrimshaw (2004) who also report (Section 2.5) that, indeed, teachers do need more time to get to know the technology. This is in direct contradiction with Ofsted (2004) who felt there was an increase in “...teacher competence and confidence with ICT.” This has raised questions as to; what type of CPD is required? This could be an interesting area for further research.

4.2 Summary of the Qualitative Data Analysis

One of the purposes for the qualitative data analysis is to provide a framework to support and substantiate the quantitative data. The trends and patterns within the qualitative data have been analysed and referenced back to the Literature Review to corroborate the results.

The results suggest that 91% of schools are using ICT at some time during their Design and Technology lessons and that in most cases over half the class are able to work on computers individually or, as recommended by most academics (Section 2.5), that the whole class can work in pairs.

Schools are now moving towards teaching ICT skills as a discrete subject within other subject areas and thus are not teaching ICT as a separate subject.

An interesting statistic from the data is that more males (12.5%) than females (7%) are not using computers in their Design and Technology lessons (Table 14). Within that data, both male and female teachers who were aged between 31 and 40 years were the group who were the least likely to use ICT in Design and Technology (Table 17). Teaching experience also seems to have an influence upon the subject co-ordinators use of ICT in Design and Technology; the more experienced (11 to 30 years experience) used ICT the most, the less experienced (0 to 10 years), used ICT only slightly less, while the most experienced teachers (31 to 40+) appear use ICT infrequently.

It would appear that the majority of teachers responding to the questionnaire mainly use Microsoft Programs. Teachers appear to only use other commercial programs when Microsoft does not cover the required area e.g. art/painting or are not user friendly - such as Access.

At the time of the questionnaire data collection, 82% of schools had Interactive Whiteboards available in their classrooms which, teachers feel, are being used quite successfully. This was

not the case with the NOF training for teachers, 54.5% of those surveyed did not find it useful at all and, indeed, central government commissioned reports in the Literature Review concluded it was not a success.

It would appear that the majority of teachers responding would like two things:

- 1) more time to learn about the programs and their application for teaching;
- 2) more reliable equipment. A majority of female teachers would like some type of technical assistance in their school.

These responses have indicated specific areas that warrant further investigation. The qualitative data from the questionnaire has raised some issues that will require further examination during the semi-structured interviews - for example:

- Is time for ICT an issue?
- Are the teachers' workload the reason why they mainly use Microsoft programs?
- What type of Continuing Professional Development would teachers require?

Questions will be formulated regarding these issues raised in the questionnaire and put to the interviewees.

The qualitative responses dealing with pupil interaction with ICT and teacher perception of the benefits or disadvantages of using ICT are analysed and interpreted in the following chapter.

CHAPTER FIVE

5 QUALITATIVE DATA ANALYSIS

5.1 Qualitative Analysis - Questionnaire

The questionnaire contained several qualitative questions regarding teachers' perceptions of:

- The contribution of ICT in education
- How they aid teaching
- How they assist pupils and pupils' reaction to ICT.

The semi-structured interview questions were based on the analysis of the questionnaire as advised by Kerlinger (1973), which then formed the basis for the focus group interview. These are analysed separately later in the chapter.

5.1.1 Teacher Perceptions of how Computers have aided Pupils

This sub-section will review teachers' reactions to their perception of pupil response in the use of ICT in their Design and Technology lessons. It will examine their subjective views and where they feel pupils have benefited through the use of ICT. It will also examine teachers' perception of how ICT has impacted upon pupil behaviour, achievement, enthusiasm, effort and any other area where they feel there has been improvement.

An overwhelming majority of 93.5% of teachers felt that pupils were enthusiastic about using ICT in Design and Technology lessons (Table 35). This is supported by the reports from DfES/ Becta (2003a) and Becta (2007) in Section 2.5 of the Literature Review.

Table 35 - Teacher Perception for Pupils Being Enthusiastic about ICT in Design and Technology Lessons

	Count	%
Yes	58	93.5
No	4	6.5

79% of the 91.2% of the teachers (Tables 36 and 37) felt that computers had raised pupil achievements. In the Literature Review (Sections 2.3 and 2.4) this belief is widely acknowledged in a number of reports.

Table 36 - Teacher Perception of How Computers Have Raised Pupil Achievements

	Count	%
Yes	49	79
No	13	21

Table 37 - Teacher Perception that Computers Raised Pupil Achievements

	Cases					
	Valid		Missing		Total	
	N	%	N	Percent	N	%
Computers raised pupil achievements	62	91.2	6	8.8	68	100

There were a number of different areas in which teachers felt pupils had had their enthusiasm raised (Table 38), which again is supported by the same areas being identified in Section 2.5 of the Literature Review in a wide range of reports. The reports are generic, looking at ICT across the curriculum and not specifically within the Design and Technology curriculum.

Table 38 – The Areas Teachers Feel Pupils More Enthusiastic About

	Speed		Accuracy		Information		Finished Product		Other	
	Count	%	Count	%	Count	%	Count	%	Count	%
Yes	17	27	15	23	38	60.3	47	74.6	11	17.5
No	46	73	48	76	25	39.7	16	25.4	52	82.5

The researcher has reported these findings as there are no specific reports regarding the use of ICT in Design and Technology. Of the teachers questioned, 74.6% felt that the ‘Finished Product’ (Table 38) had the biggest effect of raising pupils’ enthusiasm. This supported the findings of both the DfES (2003b) and DfES/Becta (2003c) in Section 2.5 of the Literature Review. Being able to access ‘Information’ accounted for 60.3% of teachers feeling that pupils were more enthusiastic. The acquisition of ‘Speed’, ‘Accuracy’ and ‘Other’ were 27%, 23% and 17.4% for raising pupils’ enthusiasm. This is supported by a number of different reports in the Literature Review (Section 2.5).

Table 39 - Other Areas that Teachers Identified as Aiding Pupils

	Other use	
	Count	%
Novelty	4	28.6
Interest	2	14.3
Interactivity	4	28.6
Independence	4	28.6

There were four ‘other’ areas (Table 39); ‘Novelty’, ‘Independence’, ‘Interactivity’ and ‘Interest’. The first three have the same percentage count of 28.6%, while ‘Interest’ as counts for 14.3% of the positive responses. This is a low count when comparing it to the report of NFER/Harris and Kington (2002) who suggests that ‘Independence’ is one of the strengths of pupils using computers (Section 2.4). This data raises questions about the number of respondents (79.4%) who did not respond to this question. Why have so many teachers not responded? (Table 40). It would have been interesting to follow up why so many respondents did not reply to this question but time did not allow. It could be the basis of further research.

**Table 40 - Teacher Identified
Other Areas for Pupil Enthusiasm**

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Other use	14	20.6	54	79.4	68	100

It could be that teachers are not fully aware of their pupils' enthusiasm. This could be due to a number of factors: teachers are using computers but not in an open-ended or creative manner, or they are not using them for sufficient time to be able to draw any worthwhile conclusions. This will make a basis for a question during the semi-structured interviews.

Table 41 - Teacher Perception of Pupil improvement

		Frequency	Percent
	Total	53	77.9
Missing	System	15	22.1
Total		68	100.0

**Table 42 - Teacher Perception of
the Areas ICT Can Assist Pupil Improvement**

	Behaviour		Engagement		Work Standard		Effort		Attainment	
	Count	%	Count	%	Count	%	Count	%	Count	%
Yes	15	28.3	34	65.4	30	56.6	26	49.1	16	30.2
No	38	71.7	18	34.6	23	43.4	27	50.9	37	69.8

Of the teachers surveyed, 22.1% (Table 41) did not respond to the question regarding the areas in which ICT can assist pupils and yet great benefits are widely reported in Section 2.3 and 2.5 of the Literature Review. If teachers cannot see any benefits for using ICT then they are not going to be enthusiastic about using it or see its worth. 'Engagement', at 65.4%, is the most noticeable area that teachers feel pupils have improved through the use of computers (Table

42). This is closely followed by ‘Work Standard’ at 56.6%, which is not surprising as Becta (2001) and Ofsted (2004) both agree that this is a major area of raised pupil achievement (Section 2.1). Throughout Section 2.3 in the Literature Review, improvement in behaviour is reported by Becta (2004) and Ofsted (2005d) and yet only 28.3% (Table 42) of teachers feel that behaviour has improved through the use of ICT. Indeed it is the lowest of the five areas where teachers feel there is pupil improvement. This could have been due to any number of different factors: lack of resources to enable pupils to work in twos or individually, lack of teacher classroom management, lack of classroom discipline or over excitement by the pupils, to name but four. This requires further research.

Teachers appear to recognise generally that ICT has aided pupils to become more engaged which allows them to achieve higher standards in their work. As a result effect behaviour will also improve increasing pupil enthusiasm, which in turn aids pupil attainment and effort.

5.1.2 Teachers’ Perception regarding Computer Skill Transferability

The majority of teachers are teaching ICT both during and before Design and Technology lessons. These teachers (83.3%) are convinced that ICT skills are transferable and useable in other curriculum areas (Table 43); this is supported by the Literature Review (Section 2.4) from a number of different reports.

Table 43 – Teachers’ Belief that ICT Skills are Transferable

	Skills are transferable	
	Count	%
Yes	50	83.3
No	10	16.7

Teachers' perception of ICT skills, from the data, shows that the vast majority of them believe that these skills are transferable into other areas of the curriculum, just as well as skills learnt in other areas being transferable into Design and Technology lessons. This perception should be evidenced in how ICT is used within their classrooms in other subject areas. A range of resources should be being used in a variety of situations.

5.2 Semi-structured and Focus Group Interviews

The qualitative analysis was based upon semi-structured interviews and a focus group interview. During both types of interview the discussions were recorded, with interviewee permission, onto mini-disk and later transcribed. The transcribing of the interviews was ICT processed, producing both a hard and electronic copy of all interviews. This enabled the data to be thoroughly analysed. Kerlinger (1973: 273) advises that semi-structured and focus group interviews are used;

...to follow up unexpected results, for example, or to validate other methods or go deeper into the motivation of respondents and their reasons for responding as they do.

To give meaning to the data, the semi-structured interviews and focus group interview were employed to interpret a range of themed questions based upon data from the questionnaire.

The area of research has considerable importance to the researcher and both Education Authorities. The temptation is to show the outcomes as highlighting good practice, quality use of ICT in Design and Technology and teacher satisfaction. To eliminate bias throughout the data, as qualitative data is subjective (Robson,1993), it is necessary to control both the

collection and the analysis of the data. The samples must be representative, the questioning detailed and penetrating and the analysis subjected to as many internal checks as can be applied (Robson, 1993; Cohen et al, 2000). Interviewees were given an opportunity to comment upon the transcripts. There were no amendments required as a result of this procedure.

To ensure a representation in the questionnaire and semi-structured interviews, the questionnaire sample was cross-referenced with DfES and LA statistics outlining the makeup of primary teachers for gender, age and teaching experience. These closely resembled the make up of the questionnaire sample, acknowledging that a large percentage of Nursery, Foundation and KS1 teachers are female. No breakdown data by individual Key Stage was available; the DfES information was categorised into Nursery + Primary, Secondary and Special School and only available up to March 2003. The LAs' profile was categorised into: Primary, gender and age all of which was current for 2005 (Section 3.14.1; 3.14.2).

The semi-structured interviews were conducted using a predetermined set of questions which had been derived from the questionnaire responses (Appendix 5). Each of the six main questions were supplemented by two further questions as advised by King (2005b). These were used for deeper investigation or when the respondent did not or could not answer the primary question.

All the respondents cooperated fully in answering the set questions. It soon became apparent during the analysis of the semi-structured interviews, that there were a number of themes beginning to appear within the responses. The responses were analysed both as the primary questions and also as the appearing themes. To ensure a rigorous cross-checking of data, the

data was cross-referenced with the questionnaire data and the Literature Review as suggested by Robson (1993) and Cohen et al (2000).

5.3 Semi-structured Interviews

5.3.1 Awareness, Benefits and Difficulties with ICT

Teachers were very accommodating in giving their views regarding the benefits and difficulties of using ICT, for both themselves and for pupils. (For interview transcriptions see Appendix 5 and CD Rom.) One teacher described ICT as being;

... like my right arm... I know I couldn't live without it basically.

(Interviewee 9)

This view was repeated throughout the interviews and concurs with the quantitative data results (Section 4.1.1) and the Literature Review (Section 2.5):- that teachers are using ICT more and can see benefits from using it. Table 44 also confirms this point of view from the qualitative interviewees, who support this 100%.

Table 44 – Respondents who are aware of the benefits of using ICT

Gender	Male	% Male	Female	% Female	Total	% Total
See benefits of ICT	4	100	6	100	10	100

Table 45 - How many teachers indicated that they used ICT for their planning - gender during the semi-structured interview

Gender	Male	% male	Female	% Female	Total	% Total
Used ICT in planning	3	75	3	50	6	60
Did not mention using ICT for planning	1	25	3	50	4	40

The teachers were very aware that ICT was also helping them in their administrative duties. 100% (Table 45) of the semi-structured interview respondent teachers reported that they appreciate how ICT assists in their administrative duties;

...we can keep everything up to date as far as our targets and our levels are concerned that's one of the benefits.

(Interviewee 7)

...within school we use ICT for planning

and;

...all the planning that's within the school is produced on standardised proformas for ICT...

(Interviewee 3)

This was also the view of Ofsted (2005c) as reported in the Literature Review (Section 2.5), but these views were not supported by the questionnaire data (Section 4.1.2), where only 19% of teachers were using computers for planning. There was an increase of teachers using ICT for their planning as reported by the semi-structured interviews. There was also a disparity of usage between male and female teachers: 75% of males interviewed used ICT in their planning while only 50% of females used ICT. This increase of usage could be due to a number of different reasons. Could it be that teachers, in the time between the questionnaire

and semi-structured interviews, have suddenly embraced ICT for their planning or it could be that the schools where the interviews took place are ones where staff are expected to use ICT for planning? Teachers' responses to this sudden use of ICT to plan and help were;

... I think that something has blossomed possibly in the last year, 18 months...

(Interviewee 10)

... (ICT is used) for preparation... which is invaluable.

(Interviewee 1)

Table 46 - Teachers using ICT to give a professional quality appearance to their work - gender

Gender	Male	% Male	Female	% Female	Total	% Total
Teachers using ICT to improve appearance of their work	2	50	5	83	7	70
Teachers not mentioning using ICT to improve appearance of their work	2	50	1	17	3	30

The view that ICT helps in preparation is supported by the data from the questionnaire (Section 4.1.2) and the Literature Review (Section 2.5), which showed that the greatest use of computers was for 'Researching Ideas' and 'Collecting Information'. As well as being an aid to their planning and administrative duties, teachers reported that ICT was an aid for the professional quality of their worksheets, displays, keeping up to date with information and a useful resource. Female teachers (83%) use ICT to improve the appearance of their resources, whilst only 50% of male teachers mentioned using ICT to improve the appearance of their work. This could be due to the fact that some of the other 50% of male teachers see the benefits of using ICT and take the professional presentation of worksheets to be the norm and therefore did not mention its usage (Table 46). As one teacher said it is;

...professional presentation, quality's far better than handwritten stuff on the board, plus you can put animations, videos, images, colour, (and) sound...

(Interviewee 5)

This was not reported in either the Literature Review or Questionnaire data. This would suggest that teachers have begun to embrace the use of ICT in their everyday work. This could be the basis for further research.

Table 47 - Teachers aware of pupils' entitlement to ICT – Gender

Gender	Male	% male	Female	% female	Total	% Total
Teachers aware of pupils' entitlement	2	50	1	17	3	30
Teachers who did not mention being aware of pupils' entitlement	2	50	5	83	7	70

All the teachers that were interviewed implied indirectly that pupils had an entitlement to be taught ICT but only 30% of the teachers (Table 47) directly mentioned that pupils had any entitlement: 50% of male teachers whilst only 17% of female teachers mentioned it. As there are quite clear directives in the National Curriculum regarding the use of ICT, then this apparent lack of awareness for the entitlement could be due to teachers are now taking it for granted.

The Literature Review (Section 2.2) also highlights pupils' entitlement to the use of ICT within Design and Technology.

... if anybody doesn't use the thing as thoroughly as they can, then they are denying the children something and the children have a right of access ...

(Interviewee 3)

From the qualitative responses, teachers are conscious of their professional duties and are keen to fulfil them. This was highlighted when the teachers showed how very aware they were of our dependence on ICT within our society and the importance of making pupils aware of ICT. Teachers are also very conscious that they have to embrace the ‘new’ technology;

... we live in an ICT world nowadays whether we like it or not and so, no matter where you go they're faced with ICT of some sort or other. ... anything we do within school is going to enhance their understanding of ICT throughout the new world ...

and;

...you can't be a Luddite and sit there and ignore it, you've got to embrace a thing and use it properly...

(Interviewee 4)

... it's up to us as professionals to take on board these new strategies and new technology.

(Interviewee 3)

Table 48 - Headteacher and Management Support for ICT

Gender	Male	% Male	Female	% Female	Total	% Total
Management support for ICT	4	100	5	83	9	90
No management support for ICT	0	0	1	17	1	10

There was no data either in the Literature Review or the questionnaire data to directly support these findings, but from the teachers' attitude and school management initiatives (Table 48) for ICT to be moved forward, it would appear that ICT will have to been given a much higher profile in one of the interviewees' school.

...the Head that's been quite keen on ICT.

(Interviewee 1)

...there is a lot of support within the management within the school...

(Interviewee 4)

... it's the boss that's very progressive, very for IT...

(Interviewee 1)

...there is definitely a program within school for moving ICT forward.

(Interviewee 7)

The majority of staff were well supported by their Headteacher and management teams. The support was not only a personal interest but also a professional one in that they were aware of the benefits of ICT and had a rolling programme in place for support and replacement of hardware (Literacy Review Section 2.4). This is a clear indication that the Headteacher and management team see ICT as an important area to be continually developed.

Teachers were also aware that ICT had its limitations. In Section 2.5 of the Literacy Review, Smeets and Mooij (2001), Ofsted (2004) and DfES (2005) acknowledge that ICT should not be used just for the sake of using it and that e-learning and traditional teaching methods should complement each other. Teachers understand that sometimes it will take longer using ICT or that it is not the appropriate method to use.

ICT is a tool and I find that if you treat it as a tool it's a useful tool. It's not a means to an end; you can't base every single lesson purely on ICT...

and;

...because it would take you twice as long to do something, and the whole point of ICT is you only use it when it's necessary, you shouldn't use it for any other reason, you know, other than when it's the best thing you can use.

(Interviewee 3)

Table 49 - The number of teachers' negative responses to the benefits of using ICT

Gender	Male	% Male	Female	% Female	Total	% Total
Number of negative responses	2	50	1	17	3	30
Number of positive responses	2	50	5	83	7	70

There were only a small number of negative responses to the benefits of using ICT. Table 49 shows that there were a number of negative male responses (50%) - these were from the males who had high ICT skills. They were only negative towards restrictions placed on their computer use and the lack of high-level technical support. The female responses (17%) referred to do with a lack of general technical support and breakdowns of the hardware and its effect upon lessons.

...all they do is put the big set of filters on and have some admin. chappy come in taking all our privileges away from us and constrict the machines...

and;

...you can have a wonderful machine but if go and throttle it with restrictions it's not worth jumping on and they are a bit restrictive, and it rubs raw occasionally, and that's the authority input for me.

(Interviewee 3)

If it works, then it's fine. You know, it's the fault finding that's the problem when it doesn't work and the frustration...

(Interviewee 5)

My frustration is, I can use a program, I know how to use a program, you're in the classroom with 30 children and the ICT doesn't work and then you've got a chaotic lesson.

(Interviewee 8)

This was reflected in the questionnaire data (Sections 4.1.4 and 4.1.5) where 4% of male teachers and 5% of female teachers (Table 34) were asking for more technical support.

A younger teacher and an older, recently qualified, teacher did complain that older teachers did not want to, or were not willing to, embrace ICT. This could be just the two schools used in the research interviews. Their observation does concur with Cullingford's (2001) suggestion that teachers develop their own teaching style, which Webb (2002) further suggests becomes more didactic with time (Literacy Review Section 2.1). The suggestion that older teachers did not 'use' ICT in class is in direct opposition to the findings of both the questionnaire and Literature Review (Section 2.5). In the questionnaire responses (Table 15) it was the 31 to 40 year old teachers that did not use ICT in their lessons and older teachers were found to be the ones who used ICT regularly, while the Literature Review NFER (2004) found that there was no clear correlation between age and computer usage. As one teacher commented;

...a large proportion of teachers are ...not necessarily au fait with IT, they're frightened of IT ... Some staff still resist. ... Although it's changing, I've noticed it's changing.

(Interviewee 5)

There was only one negative response regarding the use of ICT during Design and Technology lessons.

If you could do ICT and Design and Technology in the same room it might work, but junior schools just aren't set up for that.

(Interviewee 6)

This response was based upon pupils being able to access computers during Design and Technology lessons. Many primary classrooms have computers or mobile trolleys with lap top computers as well as having an Interactive Whiteboard – which, according to the quantitative

data, are being used for collecting information, presentation, designing and problem-solving through discussion for a variety of subject areas.

Table 50 - Teachers using ICT during Design and Technology lessons

Gender	Male	% Male	Female	% Female	Total	% Total
Using ICT during D and T lessons	3	75	5	83	8	80
Not using ICT during D and T lessons	1	25	1	17	2	20

Table 50 shows that 80% of the teachers interviewed were using ICT during Design and Technology lessons. This compares with 91% of teachers in the questionnaire results. This discrepancy of one male and one female not mentioning using ICT during Design and Technology could be due to them assuming that they implicitly used ICT across the curriculum.

This was substantiated with the other responses (Table 51), which were positive and encouraging regarding the use of ICT during Design and Technology. Teachers said;

The children are benefiting not just from the point of view of DT, but throughout the whole curriculum...

and;

...to present ideas in Design and Technology and other subjects, I can make a slide show of images, ...which have captions to reinforce learning ...

(Interviewee 3)

... if you can log on to something and show it to everybody, or have a slide screen going of resources, everybody can see, whereas if you've only got a small screen it's impossible. And I can see great benefits there.

(Interviewee 6)

Table 51 - The number of teachers who feel positive about ICT during Design and Technology lessons - Gender

Gender	Male	% Male	Female	% Female	Total	% Total
Teachers who feel positive about ICT	4	100	6	100	10	100
Teachers who feel negative about ICT	0	0	0	0	0	0

Being able to show pictures and diagrams on large screens using Interactive Whiteboards was also something that teachers saw great benefits from being able to;

...put together diagrams instead of handing out diagrams, I can actually put a whole page diagram for DT actually onto the ICT format.

(Interviewee 3)

It would appear that teachers are beginning to see the value of ICT for teaching and learning, as these comments indicate;

...children particularly who have very creative ideas in DT but find English and writing a struggle, ...they're able to type their responses or evaluations of things that they've done rather than not get the creative ideas down because they struggle with the process of writing. So I've found certainly the processing as a word processing document certainly helps the.

(Interviewee 8)

...from a pupil's perspective, particularly in technology from a design process, then we use various design programs and this gives them more of a professional perspective on what they're doing.

(Interviewee 7)

...for children again who like perfection and like to see the designs in a clear form, aren't always happy with their own drawing skills ...(ICT) enables them to get very clearly labelled diagrams and things in the design process as well.

(Interviewee 8)

At all stages of Design and Technology work ICT is being seen as being an aid to ensuring that pupils stayed on task as well as being another way of working;

...I think often it enhances something and it also provides a change instead of doing everything in the same way, it keeps the interest levels up I think.

(Interviewee 8)

...we teach the children control technology ... those control programs for teaching children systematic approaches for ICT control circuits (by using) a model if you like, a simulation model.

(Interviewee 3)

...CAD/CAM procedures and all these are improving and increasing their (pupil) confidence and their finished products and their knowledge.

(Interviewee 7)

This data suggest that ICT is being used not only in Design and Technology but cross-curricularly by teachers. They now are aware of the benefits for themselves and the pupils as well as their professional responsibilities.

5.3.2 Pupil Involvement

All ten of the interviewees (Table 52) agreed that ICT and especially interactive whiteboards keep pupils interested, enthusiastic, motivated and focused upon the teaching and learning.

Table 52 - Teachers' perception of pupil reaction to using ICT

Gender	Male	% Male	Females	% Female	Total	% Total
Teachers aware of pupil reaction to ICT	4	100	6	100	10	100
Teachers not aware of pupil reaction to ICT	0	0	0	0	0	0

These findings are supported by the work of Moseley and Higgins (1999), DfES (2002), Azlan Tech Data Group (2003) and DfES/Becta (2003d) as reported in the Literature Review (Section 2.3) as well as Becta (2002c, 2007) and DfES/Becta (2003a) in Section 2.5 of the Literature Review. This concurs with the analysis of the questionnaire results (Section 5.1.1. Table 35), where 94% of teachers felt that pupils were enthusiastic about using ICT.

The teachers interviewed commented that pupils;

... were absolutely fascinated ...

(Interviewee 1)

...gets them engaged ...

(Interviewee 2)

...they're interested and it's bright and you know it's not just a boring piece of paper any more. They love ICT...

and;

...focussed, you've got them looking at one place and that one place is the board with you are operating it. ... I find it allows me to maintain a pace within the lesson with the children looking at you, involve the children ...

(Interviewee 3)

...they realise their potential... they've got some ability and that it can be developed.

(Interviewee 4)

This is supported by reports from Becta (2003d) and DfES/Becta (2003d) in Section 2.3 of the Literature Review. Also acknowledged is the fact that they are;

...improving and increasing their confidence and their finished products and their knowledge.

(Interviewee 5)

...motivated, particularly the boys who don't like writing very much but if they're actually doing it, they're working on a computer, then it keeps them going.

(Interviewee 7)

... (ICT) motivates them, engages them in the learning.

(Interviewee 9)

...more enthusiastic, they realise their potential, they realise they've got some ability and that it can be, you know, developed.

(Interviewee 5)

Throughout the interviews it was implied that ICT had a positive effect upon pupils, which is supported by the questionnaire analysis, in which 79% (Table 36) of teachers felt that computers raised pupil achievements. The Literature Review supported this finding through a number of different reports (Section 2.5).

The teachers were also aware that skills taught or gained in one area of the curriculum could be transferred and were also skills for life. As one teacher put it;

... (ICT) does have lots of skills that they can use later on in life.

(Interviewee 6)

This is supported by the questionnaire results (Section 5.1.2. Table 43) where 83% of the teachers thought that ICT skills were transferable. This was also reported within the Literature Review Section 2.4.

There were no remarks regarding ICT having anything other than a positive effect on pupils. The teachers appreciated and were strongly aware that ICT was making a marked contribution to the teaching and learning going on in their schools, although they used different terminology and descriptions for the improvements. This positive attitude towards ICT is

supported by Becta (2002b) and Ofsted (2003, 2004) as reported in the Literature Review (Section 2.3).

Not one of the interviewees mentioned behaviour throughout the interviews. It could be that this, as reported in the Literature Review (Section 2.3), is not an issue when using ICT in the classroom. Yet only 28% of teachers in the questionnaire (Section 4.2.1) thought that ICT helped improve behaviour, Becta (2002b), Ofsted (2004) and QCA (no date) all reported that there was an improvement in behaviour through the use of ICT. This could be that, again, things have moved on at a pace since the questionnaire and teachers now take it for granted that pupils will be fully engaged when using ICT.

5.3.3 Programs

There are a number of issues regarding programs that all the respondents had concerns about. The first major issue was concerned with the fact that there are so many programs on the market. As reported in the Questionnaire data (Section 4.1.5) teachers felt that they needed;

“...more time to understand the programs.”

(Interviewee 6)

Table 53 - How many teachers felt they needed more time to understand ICT Programs

Gender	Male	% Male	Female	% Female	Total	% Total
Number of teachers who felt they need more time with computer programs	3	75	5	83	8	80
Number of teachers who felt that they do not need more time with computer programs	1	25	1	17	2	20

Table 53 shows that 80% of the interviewees felt they needed more time to understand the computer programs. This figure will be distorted as one of the male interviewees was an industrially-trained computer technician and therefore was familiar with programs. The female interviewee has had long experience of working with computers and was personally well experienced with using programs, although she did speak, in general terms, about the staff of her school requiring more time.

This view is supported by Kennewell and Beauchamp (2003), Becta (2004) and Scrimshaw (2004) and in the Literature Review (Section 2.5). It could be that teachers now have had sufficient time to familiarise themselves and start using the Microsoft programs which aid them as suggested in the Literature Review (Section 2.5) by Kennewell and Beauchamp (2003), Becta (2004) and Scrimshaw (2004). Could it be, as suggested by Moseley and Higgins (1999) in the Literature Review (Section 2.4), that teachers have reached a critical point where their confidence and skill spur them on. Whatever the influence upon teachers, it would now appear, from the semi-structured interviews that they are indeed beginning to use ICT in their everyday work.

It was still felt that there were too many different programs for teachers to be able to keep up with 'what is current'. As teachers explained;

... the ICT Co-ordinator get sent lots and lots and lots of different things for the same job and you just don't know which would work, which would be best, so you just think well I'll stick with what I know and use that really.

(Interviewee 2)

... teachers haven't got time to actually find out and explore new programs...

(Interviewee 4)

They need ...to have time actually ...and that is to actually look at programs that are available.

(Interviewee 1)

...we don't have time to get to know the software...

and they need;

... time to play. We try and put inset days and staff meetings in to do that but it's only a limited amount of time.

(Interviewee 10)

The last comment showed that the management were aware of the problem and were trying to address the lack of time to understand the programs. This view is also supported by the Literature Review (Section 2.5) as reported earlier in this section.

Two other recurring themes through out the interviews regarding programs, besides that of time were:

- 1) The cost of programs
- 2) The ease of access and the usability of Microsoft programs.

The teachers interviewed were very much aware of the need to be selective in choosing new programs because of their expense and the cost of the site licenses.

Because there's a lot of products on the market and obviously we've not got unlimited budgets and unless someone's recommended something to me or to one of the other members of staff, then you know we don't know so we tend to not go for it really.

(Interviewee 2)

It's a lot of money to take a gamble if you like on an unknown piece of software. The software companies themselves don't seem to be keen to send out samplers.

(Interviewee 3)

It is not only the selection of the program but also being able to use the program easily once it has been bought that was also an issue with teachers. Another reason was:

...the cost of the programs, time to understand how the program works ...

and;

I bought a design, control program a couple of years ago, I know it's terrible but I've had a look at it and it's, it's just too complex for me to get hold of and I certainly haven't got time to actually study it enough to make the program more simple for the children to understand.

(Interviewee 4)

Ease of use. That's the main thing. It's got to be easy to use; you can't spend hours faffing about reading booklets. Most of the ones we've got are very easy to use, you know, you click on this and this happens. It does exactly what it says. So the things that we like are ease of use. Don't like lots of things that are complicated things that you've got to do a lot of explaining with when a teacher might not be so confident with it anyway.

and also;

...if it's a simple,...(and) if it's an easy to use program, fairly straightforward then you won't have to spend too much time learning how to use it, which we just don't have, ...(also) when we're teaching lots of different subjects we don't have time to be doing,...(having to) learning a new program for each subject area each half term.

(Interviewee 2)

Ofsted (2004) report in the Literature Review (Section 2.4) that teachers are becoming more discerning about their choice of software; this does not appear to be an accurate picture from the data in the semi-structured interviews (Table 54). The table shows that the majority of teachers use Microsoft programs regularly during their lessons, which disagrees with Becta's (2004) and Ofsted's (2004) reporting.

Table 54 –The number of interviewed teachers who regularly use Microsoft Programs in their lessons

Gender	Male	% Male	Female	% Female	Total	% Total
Number of teachers who regularly use Microsoft programs	3	75	6	100	9	90
Number of teachers who do not regularly use Microsoft programs	1	25	0	0	1	10

It would appear that teachers were being cautious with regard to spending limited funding and also more concerned with the ease of usage of the programs. Section 4.1.2. of the Questionnaire reports that teachers use Microsoft programs more frequently than any other programs.

Microsoft programs are generally very good they are also perhaps readily installed on networks on computers that are generally round the school. Microsoft programs are understood and used by pupils across the curriculum.

(Interviewee 7)

...the Microsoft things are so powerful and they come bundled with the machines anyway, that it seems, you know, a strange decision to want to buy something else when you've got a set of office programs there...

and;

They're bundled on there so we know probably how to use those more than some of the others...

(Interviewee 1)

I would think probably availability...they're probably the first ones that they know about.

(Interviewee 9)

These were some of the reasons that the respondents gave for the high user frequency of Microsoft programs. The statistics are slightly distorted as one interviewee is industrially

trained and is familiar with a range of programs and their usage. Where he not, then the researcher feels that this figure would also be 100%. He did comment that: "...people don't even consider other software." This suggests that he does.

Microsoft programs are open-ended, which allows for pupils to input their own data for high-level thinking of analysis and discussion, as reported in Section 2.1.4 of the Literacy Review. It would appear that teachers are not becoming more discerning but are actually becoming narrower in their use of computer programs as they know the Microsoft programs very well: they are comparatively easy to navigate by both teachers and pupils, while being ideally suited to the task in hand. Respondents said about other commercial programs that;

...as far as some of the subject specific programs have been concerned, I haven't always found them to be easy to use.

(Interviewee 7)

...its about time, there's no time to sift through and sort out what is good and what is bad ...Microsoft, there it is right in front of your face, you think that seems reasonable, it seem accessible and, some of the targets can be attained through it, so that rather than pushing new boundaries you feel it's safe, it's in the bag.

(Interviewee 4)

...It gives comfort because you haven't got time.

(Interviewee 10)

...people don't even consider other software. ...Microsoft has got such a hold that people think that that's the only avenue to go down. I think there's a lot more.

(Interviewee 5)

Again and again teachers kept returning to the fact that they did not have time to ‘play’ or ‘get to know’ new programs. Teachers suggested that it might;

...be really good to know somebody who’s got the program and run it and know whether it works, because it’s a lot of money.

(Interviewee 10)

but;

...I still think there are more programs I could be using but what I’ve decided is I’ll use the small ones that I can use effectively this year.

(Interviewee 8)

Maybe;

... somebody who’s in charge of actually perhaps something like a database so if I was looking at something ...then I could go on to a catalogue system like the Dewey System almost,...But I think that’s what teachers need I think in terms of support now, appropriate programs and time to look at them.

(Interviewee 4)

Nearly all the teacher responses agreed that Microsoft Office was very familiar and they were very aware of the whole Microsoft Office package when booting up a computer, but one teacher disagreed;

No. I don’t think most people are. Even when I taught IT some of my colleagues in the department were not very familiar with Access, so in fact they were very weak on data bases.

(Interviewee 5)

Table 55 - The number of interviewed teachers claiming to know Microsoft Access

Gender	Male	% Male	Female	% Female	Total	% Total
Number of teachers claiming to know Microsoft Access	1	25	3	50	4	40
Number of teachers who are not aware of Microsoft Access	3	75	3	50	6	60

This view is supported by some of the comments made by the interviewee teachers when they said that they were not aware of Microsoft Access (Table 55);

I've never really heard of that.

(Interviewee 2)

I don't know actually what we've got.

(Interviewee 10)

I've never heard of Access.

(Interviewee 8)

Of the teachers in the questionnaire, 100% also reported that they did not use Microsoft Access (Section 4.1.2).

Access is a program within Microsoft Office which, from the comments above, would suggest that teachers are not even fully aware of the programs in Microsoft Office. Some interviewees knew of Access but suggested that because it was not 'user friendly' they did not use it;

Although it's a powerful program I think it's not very user friendly really...

and;

...people are used to working a certain way and the program doesn't work in some respects how they expect it to...

(Interviewee 5)

...we're using Excel a lot and we don't use Access, no specific reason.

(Interviewee 7)

Data handling, I would expect they're using Excel.

(Interviewee 10)

The fact that it does not work as most other Microsoft programs do could put people off. This could be explained by the fact that the program is not easy to use and, as reported earlier, if programs are difficult to navigate or understand then teachers do not have the time to get to know the program and therefore do not use them. Teachers are using programs that are readily available, they are familiar with, easy to navigate and ‘do the job’.

5.3.4 Interactive Whiteboards (IWB)

Table 56 - The number of Interviewee teachers who viewed Interactive Whiteboards positively

Gender	Male	% Male	Female	% Female	Total	% Total
Number of teachers who viewed IWBs positively	4	100	6	100	10	100
Number of teachers who did not view IWBs positively	0	0	0	0	0	0

The use of Interactive Whiteboards (IWB) was one of the issues for discussion during the interviews. The vast majority of interviewees agreed that IWBs are a positive asset for teaching and learning (Table 56).

Teachers commented that;

... ICT motivates, particularly now we all have Interactive Whiteboards in the classroom.

(Interviewee 10)

...they love using the Smartboard.

(Interviewee 2)

...the major influence ... it's been the interactive whiteboards.

(Interviewee 1)

It would appear that there was some disquiet amongst some teachers with the introduction of IWBs as reported by these teachers;

Most teachers turned, I think, from being very insecure and in many cases sort of angry about another dollop of ICT, from that they turned to actually thinking “Well actually it’s quite nice you know, with all the ways in which you can use interactive whiteboards, bringing kids to it and getting them involved and enhancing lessons”.

(Interviewee 4)

...when the Interactive Whiteboards were suggested I think teachers were frightened to death but actually it’s worked out really well...

(Interviewee 4)

The Literature Review (Section 2.3) Fabry and Higgs (1997 cited in Scrimshaw 2004), say that teachers must make two changes: 1) learn about the new technology and 2) fundamentally change how they teach. Certainly one teacher commented that;

...I don’t think people have been as frightened about the Interactive Whiteboard as they were about the computer.

(Interviewee 10)

It would appear that, generally, teachers are getting better at using the technology, as reported by interviewed teachers;

...they use their laptops and computers and they link everything up.

(Interviewee 6)

This would suggest that teachers are embracing the new technology; in fact they cannot wait for it;

I do think we need Interactive Whiteboards everywhere with the training...

and;

...(the training) was actually using technology, ICT in Design and Technology. It's fine while you're there but then the practicalities of using it when you come back, if you don't have an Interactive Whiteboard say, you can't do it.

(Interviewee 6)

...the Interactive Whiteboards that's a rolling program and I know that is something, I mean if we had Interactive Whiteboards in every room that would be ideal.

(Interviewee 7)

Although 90% of teachers from the questionnaire said they were using computers during Design and Technology to various degrees, 81% of them said they were using computers only occasionally and infrequently. Would this now be the same with the sudden influx of IWBs? Certainly the teachers interviewed were using IWB;

We've got lots of ... websites that can help explain concepts much easier than may have done in the past, because they can see it visually as well as you talking about it ...

(Interviewee 10)

Other members of a school staff who did not have an IWB, were;

... swap(ping) classrooms if there's something that they particularly think, "Oh the whiteboard would be really good for us to do this", then they'll arrange to swap classrooms ...

(Interviewee 9)

This embracing of IWBs is further exemplified by yet other interviewee teachers who have;

... joined a network group with other schools, myself and the Year 5 teacher we're on this Interactive Whiteboard network, we meet up once a term to look at programs and things but that's just a choice, something I do in my own time.

(Interviewee 8)

... video clips, fantastic images of things that would not normally have seen, and also, well, teaching things like ICT is great because you can actually model it the board which is fantastic.

(Interviewee 4)

Modelling and discrete teaching of ICT skills is now a high priority of Ofsted during their forthcoming inspections (HMI/Ofsted/ITTE. 2006).

The examples above would suggest that teachers are committed to using IWB within their teaching which also involves them in continued professional development with the new technologies.

Not only does the teaching staff appreciate the use of IWBs, the pupils also enjoy using IWBs, according to the teachers. Table 57 shows there is a 50/50 divide within both male and female teacher population as to whether pupils appreciate using IWBs. This divide could be explained by the fact that some of the schools did not have IWBs in all the classrooms and some of the interviewees' schools were quite new to IWBs. This could well be a very similar stage of development as suggested by Moseley and Higgins (1999) in the Literature Review (Section 2.4), where teachers have reached a critical point with their confidence and skill, which then spurs them on; only this time it is the pupils who are at this crucial stage, while others have surpassed this stage and are now familiar with the IWB and its usage.

Table 57 - Teachers who feel that Pupils Appreciate IWBs

Gender	Male	% Male	Female	% Female	Total	% Total
Number of teachers who feel that pupils appreciate IWBs	2	50	3	50	5	50
Number of teachers with a nil response	2	50	3	50	5	50

Key Stage 2 pupils were reported by the interviewees, as well as in the Literature Review (Section 2.5), that;

...they love using the Smartboard...

(Interviewee 2)

...it's (IWB) a lot more visual so certainly it gets the attraction of the visual learners.

(Interviewee 6)

...the children will come out, we're not going to deny them access to a Smart board, it can take a fair bit of hammer and we're more than happy to have the children using it.

(Interviewee 4)

...certainly in terms of Interactive Whiteboards that's been really important, it's meant that children have been totally focussed on new sessions.

(Interviewee 1)

...it's inclusive by its very nature because it's there and the children can come and use the technology so that, you know, that they're interacting with the ICT.

(Interviewee 3)

...they can come up and be learning and it's not like if you get something wrong and a teacher will tell you off, it's bright and it's fun and it's like playing a computer game at home which they like doing.

(Interviewee 1)

...now we all have interactive whiteboards in the classroom... it motivates them (pupils) to do things.

(Interviewee 10)

Or this could be the fundamental change that teachers need to achieve as described in the Literature Review (Section 2.3) by Fabry and Higgs (1997 cited in Scrimshaw 2004). Certainly teachers appear to be involving pupils more in the learning process by interacting

with the pupils via the IWB as reported in the teacher comments. It could be that teachers have had time to begin to understand the technology; while also gaining in confidence and skills to a point where they begin to change their pedagogy and use ICT more in their teaching, as suggested by Moseley and Higgins (1999) reported in the Literature Review (Section 2.4). Teachers would appear to be adapting to change and keeping pace with some of the new technologies as suggested by Wheeler (2001) (Literature Review Section 2.4).

Table 58 - How IWBs are used in Design and Technology by Interviewees

Gender	Male	% Male	Female	% Female	Total	% Total
Research	1	25	3	50	4	40
Modelling	1	25	3	50	4	40
Visual Stimulation	3	75	3	50	6	60
Designing	1	25	2	33	3	30
Improve finish	0	0	3	50	3	30

In Design and Technology teachers reported that they used IWBs for three main purposes: 1) Research, 2) Modelling and 3) Visual Stimulation. This is supported by the data from the Questionnaire (4.1.2) which shows the same pattern of usage. The greatest usage would appear to be for 'Visual Stimulation' with both genders, using a variety of stimuli that IWBs supports (Table 58).

The only negative reports about IWBs, was their cost to install and that not all teachers had an IWB in their classroom. This would suggest that teachers are very keen to have them installed and be using them, which could be the basis of new research.

There appears to be a great difference in IWB resources in schools within both education authorities and schools within each authority. Some schools have only a few IWBs installed in their classrooms, while other schools have IWBs in every classroom. This differential appears

to be dependent upon attitude of the Head and management within school, which are now discussed.

5.3.5 Headship, Leadership, Management and Resources

The management and leadership of the head teacher is vital in ensuring that a school continues to move forward; as NFER/Harris and Kington (2002) (Literature Review Section 2.4) point out, the school has to have a clear vision of its goals (Ofsted, 2005c). There was apparently clarity of vision from 60% of the head teachers. This was made clear by some of the interviewees' responses, where the school has built ICT into their School Improvement/Development Plans or Inset Plans;

It's in the school development and the ICT development plan ...

(Interviewee 6)

... it (ICT) is something that is moving forward all the time and is very well supported by management.

and;

... there is definitely a program within school for moving ICT forward and, as I say, it has been one of our Inset features this year and it's continuing next year.

(Interviewee 7)

The central government is initiating the SLICT (School Leadership in ICT) programme in October 2007, presumably to ensure that all schools work in a similar way (Literature Review section 2.4).

Table 59 - The number of Interviewees' schools that have ICT in their School Improvement Plan

Gender	Male	% Male	Female	% Female	Total	% Total
Schools with ICT in SIP	1	25	5	83	6	60
Schools not having ICT in their SIP	3	75	1	17	4	40

It would seem that the schools where the female interviewees work have ICT as a part of their School Improvement/Development Plan (Table 59). There is no apparent explanation for this phenomenon. Some of the schools had a high female ratio while others had a mixed ratio of male to female teachers. Some were small schools while others were much larger. It could be that head teachers and senior management are more aware of the need to build ICT into the school's development. This could be an area for a different piece of research.

Table 60 - The number of teachers who have individual ICT Targets set by the Head

Gender	Male	% Male	Female	% Female	Total	% Total
Number of Teachers who have individual ICT targets	1	25	6	100	7	70
Number of teachers who do not have individual ICT targets	3	75	0	0	3	30

Besides the leadership ensuring that the staff were focused on ICT development, there was also individual target setting for both staff and pupils (Table 60). In Table 60 there is a very strong disparity between the genders regarding individual target setting. 100% of the females have some type of ICT target set whilst there are only 25% of the males with an ICT target set for them. This could be as a result of the management trying to ensure that female teachers are 'encouraged' to use ICT more or are the management ensuring that the expensive equipment is going to be used? Or could it be that the management are aware that this is the way forward for teachers and wish to promote the use of ICT within their school? It seems strange that

there is such a big gender divide which could be an area for further research. Teachers reported that;

...the management, are setting targets for people with ICT.

and;

...teachers are targeted to make sure that they plan and use ICT across the curriculum and that is checked by the head ... It has been part of our performance management...we've all been assessed on the use of ICT Smart Boards within maths and within literacy, actually part of our performance management is we've got to be seen to be using it.

(Interviewee 10)

...there is a lot of support within the management within the school for, not forcing people to do things, but to gently encourage people to do things with ICT...

(Interviewee 4)

There are apparently different levels and types of support for the teachers. Some head teachers encourage while others stipulate the level of ICT skill through performance management targets. This is an important feature of the school's development as Becta (2003c), DfES (2005) and Becta (2007) all recognise the value and support of the head teacher in establishing a 'vision' of how ICT is going to aid pupils' learning as well as incorporating individual professional development.(Literacy Review Section 2.4).

Two of the interview respondents commented upon the head teacher's personal interest with ICT, which is transferred into their professional life and role.

... he's very much into ICT himself and he sees that we must deliver to the children these skills for the future...

(Interviewee 3)

...we've a boss that's very progressive, very for IT at the moment and the deputy's the same.

(Interviewee 5)

This is in contrast to some head teachers who apparently are not aware of the power of ICT - especially the IWB. As one teacher reported;

...the Head wasn't too keen on them (IWB), but when he saw it he was blown away.

(Interviewee 2)

Becta, DfES and Ofsted (Literature Review Section 2.3) all agree that effective and quality teaching using well-resourced ICT facilities would appear to raise the achievement levels of pupils. It would appear that, from the last teacher comment, that some head teachers are still to be convinced of this. Certainly when it comes to funding there are differences in priorities. As reported in the Literature Review (Section 2.4) by NFER/Harris and Kington (2002), the head teacher must be very pro-active and 'creative' with the budget if they wish to see 'innovative classroom practice'.

Table 61 - How many Interviewees' schools have a rolling programme for Hardware replacement

	Male	% Male	Female	% Female	Total	% Total
Interviewees' schools with a rolling programme for hardware replacement	1	25	4	67	5	50
No mention of rolling programme for hardware replacement	3	75	2	33	5	50

In some of the interviewees' schools, the head teachers were willing to spend money on buying hardware and software by ensuring that the school had a rolling programme of replacement and updating (Table 61).

... the Head's been proactive in buying things that would work for ICT such as the Interactive Whiteboards, and we've made sure then that we've bought software that would support the National Curriculum.

(Interviewee 1)

We are updating computers, we're updating hardware and we're getting more hardware in school. So it is something that is moving forward all the time and is very supported by management.

(Interviewee 7)

The teachers were also very aware that Heads were very keen to spend their budgets wisely;

My boss says that he's keen on getting value for money out of what he's spent in school, and he's keen to have a whole staff of competent ICT users who are able to deliver the goods to the children through ICT. For the future he's constantly looking to update things ...

(Interviewee 3)

Funding for constant replacing and updating is expensive and schools have limited budgets.

Head teachers and staff are therefore aware of the dilemma that this can cause.

... we'd have to re-prioritise budgets at some point I think. I mean we've got a suite which we update so we've got a rolling program but we need to be thinking about at least getting a base unit of laptops for small groups to use. But it's just you know funding; we just literally don't have enough money to do half of what we want to do.

(Interviewee 2)

... We've got budgetary constraints...

(Interviewee 3)

... we've not got unlimited budgets.

(Interviewee 2)

there's going to be a large headache in the next couple of years with replacements of machines because we were given you know a huge tranche of money through the National Grid for learning and those machines are now coming to the end of their life.

(Interviewee 1)

It would appear that teachers are very secure with the introduction of IWBs; indeed they openly welcome their introduction into schools. The big obstacle for continued up to date teaching of ICT would appear to be the funding. This is dependent upon the head teacher's attitude towards ICT and how this is incorporated into his/her plans for moving the school forward. As reported in the Literature Review (Section 2.4) DfES/ Becta (2003c), DfES (2005) and DfES (2007) recognise the need for head teachers to have a long term plan for the up dating of hardware and teachers training to use it.

5.3.6 Training and Staff Confidence

The government-instigated training, (National Grid for Learning and New Opportunities Funding), was intended to enable teachers to become computer literate (Literacy Review Section 2.4). The programme had a mixed reception according to the questionnaire data: 46% of teachers found it useful, whilst 55% said it was not useful (Section 4.1.4). This was borne out by the semi-structured interviews, where teachers' views were very similar regarding the quality and usefulness of the training. Teachers said;

...the NGFL stuff and the stuff that we as teachers had to go through really to get that, which was pretty dire...

(Interviewee 9)

...certainly for us as a staff, there was, a very poorly conceived idea from the government about staff being trained, it was so cumbersome and bizarre. Teachers were obviously all at different levels, and they had to assess their own needs and do their own training basically...

(Interviewee 1)

...the initial training about five, six years ago, the RM which was appalling really...

(Interviewee 4)

Not all the teachers interviewed took part in the NOF training - eight actually took part. Their views on the training are shown in Table 62. This shows that 80% of the teachers interviewed who took part in the training found it to be of very little use.

Table 62 - The number of teachers interviewed who did not find the NOF to be useful

Gender	Male	% Male	Female	% Female	Total	% Total
Number of teachers who did not find NOF useful	3	75	5	83	8	80
Number of teachers who did not take part in NOF training	1	25	1	17	2	20

Indeed these sentiments are reflected by Ofsted (2004) as reported in the Literature Review (Section 2.4). Staff were not satisfied with the NGFL training at all. Yet, that there was need for further training was expressed by teachers who said that they felt there was a need for;

...lots of Inset to help us

(Interviewee 4)

That;

... I haven't actually come across very much training out of school, some of it is fairly general...

and;

... teachers' needs are quite different and they need to be addressed at the time rather than in general terms.

(Interviewee 7)

but most definitely not the NOF type training;

No, no. ... Didn't tell us a great deal, didn't help a great deal.

(Interviewee 10)

One suggestion was for;

...an idiot guide manual to some of the programs that then you can go and use and fault finding and what to do...

(Interviewee 8)

As previously discussed, there are of course budgetary considerations;

...there's courses that I could go to, although we are sort of limited budget-wise with how many courses I can go onto...

(Interviewee 2)

This one particular interviewee felt very strongly about training and said that there should be;

...more specific training. ... I feel that somebody ought to come and give whole staff sessions or whatever, in-house, or wherever, using the equipment and, you know, it shouldn't have to come down to money as to whether you can afford to send your staff on the courses or not. So I'd like more specific training.

(Interviewee 8)

There has been specific training in schools. One interviewee reported that;

We've done ICT training this year as part of our Inset and we've been looking specifically at animation and using the small video recorders.

(Interviewee 7)

Table 63 - How many interviewed teachers had training that was cascaded or in-house

	Male	% Male	Female	% Female	Total	% Total
Teachers' ICT training was either cascaded or in-house	3	75	6	100	9	90
Teachers that have not had cascading or in-house training	1	25	0	0	1	10

Specific ICT training courses were not generally the case with the rest of the interviewees (Table 63). The data suggests that 90% of ICT training that is going on in schools now is by cascading, in-house training and peer support, as these following quotes, from different teachers, suggest;

...we swap ideas and compare things we've found...

(Interviewee 1)

It's just hearing what other people are doing, you know, looking around school and going "Oh I like that, how did you do that?"

and;

I think we can all sort of fathom our way around the software. I try my best to sort of cascade what I know and a lot of the younger members of staff have been trained on them anyway.

...they put a lot of effort into it and but I think there's also a lot of effort on behalf of the teachers in the schools to help each other out and support one another and to say "Look actually if you did it like this it would be much quicker" and other teachers are very responsive to one another. Some of the teachers who do struggle with ICT are quite happy to have help from other people. So, yer, I think there's a lot of support around. I do think people see it's of real value, they actually feel it's of value they don't feel like it's an add on, it is a way of presenting.

and also;

...we tend to support each other and we come up with ideas and up and down the school you'll find there's a great number of experts, self appointed if you like, because people will have a go.

(Interviewee 2)

Also in school there is;

...the IT Co-ordinator (who) does give a bit of time to people to help them...

(Interviewee 5)

Ofsted (2002) is also reported in Section 2.1 as saying the subject co-ordinator is fundamental in giving staff confidence in using ICT during Design and Technology lessons. They achieve this by providing Inset and support but they lack the non-contact time to do this. This severely restricts their influence and support for the staff to use ICT in Design and Technology.

Besides there being 'in-house' support for teachers, teachers are also pyramid networking, as this quote suggests;

We have a network of teachers, leading ICT teachers and you can come together, we work in a pyramid system. ...we just go through either new things that have come on line, such as the Smart software that we use, whether there's been an update, it's purely voluntary, and certainly what we did in our school, we bought one of the leading teachers in for three staff meetings.

(Interviewee 1)

...I'm sent weekly a newsletter which just informs me of courses, informs me of anything particularly with ICT...

(Interviewee 2)

Teachers are aware of the fast pace that ICT moves at. Indeed they are aware of their own inability to keep pace at times;

...things are moving with ICT so quickly and actually primary schools are a bit way behind to a certain extent, 'cos there's never the funding to put things in and I think we've got to, there is always going to be a CPD element.

(Interviewee 10)

Teachers are also aware that it is not only the non-ICT specialist who has difficulty keeping up with the pace of ICT but, as one teacher also put it;

...the ICT Co-ordinator would say it's a bit of an uphill battle, she is always trying to keep on top of developments and she also needs time to play.

(Interviewee 10)

Again teachers are back to the issue of time!

With the training for the IWBs there appears to have been a different approach. The training has come in two sources: a) the manufacturers and b) the Local Authority. This appears to have been much better organised, more focused and better timed;

from Smarter Solutions, who came and did two evening sessions with us. Just basically how to get going and then a few weeks later, when we were a bit more confident, some different ways of using it as well... But two formal training sessions after school.

(Interviewee 2)

One interviewee reported on the amount of IWB training she had received as;

Basically, massive amounts in this school. I've got some tomorrow, I've got two hours tomorrow night, and I had an hour just after the June half term. Primary Solutions, the people who put the Smart boards in and Primary Solutions are coming in at least four or five times a year offering two hour inset to teach staff basics, to teach new staff basics and then to teach us follow ups and introduce new software as it arrives and is installed.

(Interviewee 3)

The difference in the amount of training available, it would appear, is due to cost as these conversations highlight;

Interviewer: *It was authority directed?*
Respondent: *It was, yes.*
Interviewer: *It seems strange that the rest of you haven't ...*
Respondent: *Had the training?*
Interviewer: *Had the training, yes.*
Respondent: *Well I think it's, again it's down to money.*

(Interviewee 6)

...only if your school can afford to send you or to pay for you to go on them that you can go and upgrade your skills.

(Interviewee 8)

To overcome some of the cost element, it would appear that there is in-house training and cascading of information and skills being done in some of the schools, with the ICT Co-ordinator supporting and assisting staff. As one interviewee reported that her training was;

...(At) the staff meeting disseminate what we've got, pass on the information, photocopy booklets and pass them and we talk about in a staff meeting so that other people can, you know, obviously have that information.

(Interviewee 8)

...as far as the whole staff were concerned, the actual members of staff who were using them (IWBs) on a regular basis, there's a sort of support group and training available then for them to they've had training as sort as things have been updated as they've gone along.

and;

...we've shared, we've shared the information that they've come up with or as I say if there's been a member of staff who's particularly wanted to do something on the whiteboard then they've swapped over and they've sort of facilitated each other in that way really.

(Interviewee 9)

Again the teachers returned to the issue of needing more time, as these quotes indicate;

Certainly with Interactive Whiteboards I think. I think time to actually become familiar with some of the programs. We do have some training but they tend to go very quickly. The people who come and train you assume that everybody's up to speed.

(Interviewee 6)

It's time that teachers have to get up to speed with new things in ICT and possibly I haven't actually come across very much of, training out of school, some of it is fairly general, and rather than addressing your needs at the time and so training that I've found useful has been from our in-house

people, either, our ICT teacher or our ICT Manager. ... teachers' needs are quite different and they need to be addressed at the time rather than in general terms.

(Interviewee 7)

Table 64 - How many teachers felt they needed more support in the use of pedagogy

	Male	% Male	Female	% Female	Total	% Total
Teachers who feel they need support in the use of pedagogy	3	75	3	50	6	60
No mention for the need for pedagogical support	1	25	3	50	4	40

ICT, as these comments illustrate;

...we've got to be able, haven't we; to move forward and use ICT to its best advantage ...we do need to teach the ICT skills discretely but equally we need to make sure that we're using them across the curriculum really as much as we possibly can.

(Interviewee 9)

When asked about pedagogical training, one teacher said;

...certainly, particularly for me the internet.

(Interviewee 8)

Teachers appear to believe that ICT is the way forward, as one teacher said;

We've now got Smart boards in every classroom, so it's accepting that ICT is the way that we are trying to fit in.

(Interviewee 8)

This acceptance of ICT along with greater skills, confidence and teacher subject knowledge are crucial to raising standards within education as suggested by Becta, (2002b), HMI, (2002), Sunderland et al, (2002) DfES/Becta, (2003c) DfES, (2003d), Higgins, (2003), Ofsted, (2004) and Scrimshaw, (2004) in the Literacy Review (Section 2.4). Easingwood (2002) suggests in

the Literature Review (Section 2.4) that when teachers use their subject knowledge and pupils' understanding of the subject, it will enable ICT to have its greatest effect. He feels that this way of thinking could not be achieved any other way. Indeed the DfES (2005) advocate that new approaches to teaching need exploring by teachers (Literature Review Section 2.4).

I quite like ICT and I certainly enjoy D & T but there needs to be some sort of rationale towards the whole thing.

(Interviewee 4)

Teachers apparently still need clarification as how to use the new technologies. They want guidance and reassurance that what they are doing is 'correct'. This is why one teacher suggested that;

...it would probably be a good idea to look at good practice from other schools. I think that sort of training is more useful than people who have may be developed the software or, I think to see good practice is the best, to see how it's actually used and how It's actually working, I think that to me is the best sort of training when you can actually see how it's being used rather than talking about it in general terms.

(Interviewee 7)

It could be that headteachers were also not aware of what was required, which is why central government has initiated the SLICT programme (Literature Review section 2.4).

Teaching staff are also aware that it is not only them but also the support staff who also need training. The Literacy Review (Section 2.4) suggests that the more competent the teacher is with ICT, the more willing they are to experiment with ICT usage, while Loveless (2003b) also suggests that more personal use of ICT will encourage more use in the classroom. As one teacher commented, support staff also use ICT in the classroom and therefore;

...support staff need to become more confident with the use of it (ICT) because we have support staff working and supporting pupils all the time.

(Interviewee 10)

Teachernet reported that;

In primary schools 85%... of teaching staff are reported to be very confident or confident in using ICT in their job.

(Teachernet: Accessed 2006)

Table 65 - How many interviewed teachers feel more confident about ICT

Gender	Male	% Male	Female	% Female	Total	% Total
Teachers feeling more confident about ICT	2	50	5	83	7	70
No mention about feeling more confident using ICT	2	50	1	17	3	30

This quote only reiterates the data from the semi-structured interviews that staff confidence appears to be increasing (Table 65). The discrepancy between the male (50%) and female teachers (83%) who feel more confident is due in part to two male and one female teacher already being ICT literate to a high level. The increase in staff confidence is largely due to staff working together in a variety of different formats for their training, which is intended to support and encourage staff use of ICT.

IWB training has been far more accepted and useable than previous government-initiated training but this could be due to a number of reasons: greater teacher awareness, an appreciation of the power of ICT, an embedding of ICT principles, the training being focused in one area and the training being developed and delivered by a commercial interest. Teachers feel that their biggest need is for time to be able to understand and apply ICT and related programs to the curriculum.

Teachers are well aware of the cost and need for further training which apparently, at the moment, is mainly done through cascading, in-house and peer training. What does concern teachers is the lack of guidance and support for the pedagogy related to the use of ICT across the curriculum.

5.3.7 National Curriculum and the use of ICT in Design and Technology

There is a great deal of information and guidance from the DfES/QCA regarding how ICT can be used in Design and Technology in the Literature Review (Section 2.2). It is quite clear that there are numerous opportunities to use ICT in a variety of National Curriculum subjects. All the teachers appear to be aware of these requirements (Table 66).

...there's plenty of it mentioned in the documentation that we receive, you can't escape it so it's not as if they aren't aware, it's not a question of awareness, it's a question of taking the thing on and actually making it work, and we have to and it's difficult.

(Interviewee 3)

ICT development now appears to have been incorporated into many School Improvement/Development Plans (SIP/SDP) using QCA documents (Table 59. Pg 151), as stated in these quotes;

...the ICT and the National Curriculum, we've put in our School Development Plan and we have mapped QCA areas for ICT.

and;

...the ICT is covered because the School Development Plan is mapped covering all the curriculum...

(Interviewee 8)

Table 66 - Interviewee Teachers concerns about the use of ICT to support The National Curriculum

Gender	Male	% Male	Female	% Female	Total	% Total
Teachers using ICT to support the NC	4	100	6	100	10	100
No mention about using ICT to support the NC	0	0	0	0	0	0
Teachers who use ICT cross-curricularly	0	0	2	33	20	20
No mention about using ICT cross-curricularly	4	100	4	67	8	80
Teachers who are not confident using ICT	4	100	4	67	8	80
No mention about being unconfident using ICT	0	0	2	33	2	20
Teachers concerned they are not planning correctly for ICT	4	100	3	50	7	70
No mention about their concerns with planning for ICT	0	0	3	50	3	30

Only one third of the female and no male interviewees mention using the cross-curricular capabilities of ICT (Table 66). This is only 20% of the total number of interviewees. This does not mean that cross-curricular work is not being done with ICT; it is possible that teachers take it for granted and do it unthinkingly. It could also be that teachers are resisting ICT. While it is recorded in the school's SIP/SDP it does not mean that it is being done as these quotes from the interviewees suggests;

...there's a lot of the older teachers who don't really want to change it (their planning) and it will take more time to include ICT in lots of different things, and they don't see that ICT could be filming something like a play or even using a video or tape recorder.

and;

...I think they are aware, but I don't think they are doing it. I think they know that they should be using more things.

(Interviewee 2)

Teachers recognise that incorporating ICT into the curriculum causes extra work for teachers, while assisting their delivery of the National Curriculum, as these quotes illustrate;

I would say that ICT supports the National Curriculum a lot, but we've had to do quite a lot of work to get to that point.

(Interviewee 10)

I think teachers are very much under pressure about ICT and the National Curriculum, it's a massive area and teachers are confused by it, they don't have time to actually sort issues out and it's just totally overwhelming, so I think they are very frightened about what's going on at the moment and I think we need more direction and we need to know what is most appropriate for what's going on because it can be frightening...

(Interviewee 4)

The time it will take to fully incorporate ICT into the whole curriculum is recognised by Becta (2004) and Holmes and Gardner (2006) in the Literature Review (Section 2.5).

It could be that some teachers are still not confident enough to use ICT within their planning. There were 100% of male teachers and 67% of female teachers (Table 66) who said they were not confident using ICT, which transposes into 80% of the teachers interviewed. This is rather confusing as Table 65 asked about teachers feeling more confident using ICT and 50% of males and 83% of females said that they did. This could be explained in that they are more confident in using the technology and programs but are not confident in the manner in which they are using them to enhance their teaching.

What seems to concern teachers time and time again is whether they are implementing their planning in a way that is expected (Table 66). In Table 66 100% of male and 50% of female teachers say they are concerned about the way they plan for using ICT in their teaching. The table also shows that 60% of those interviewed feel they need more support with the pedagogy

they are using for teaching with ICT (Table 64) and especially when referenced against the National Curriculum.

...when there's no sort of real laid down rights and wrongs it's a bit intimidating.

and;

...I think they are very frightened about what's going on at the moment and I think we need more direction and we need to know what is most appropriate for what's going on because it can be frightening and especially if you know that Ofsted are going to come.

(Interviewee 4)

What teachers are asking for is clarification; being given some direction and given some reassurance that what they are doing is what is expected, as these quotes show;

QCA, they give targets for instance for what we should achieve, but they are very, very broad, very broad in the ways in which teachers attain that.

and;

...we've got to be given some sort of autonomy but in some ways we need guidance and support ... we need lots of Inset to help us. We need somebody to actually sort out what's going on so that it makes things more accessible for us. The authority need to be sorting it out nationally or at authority level or whatever, need to be sorting it out. If the QCA are giving us such massively broad sort of subject areas that we've got to fulfil in terms of ICT, then they need to support us in more detailed ways really and not just say they want this happening with the brightest children and that happening with the low ability children. I think we just need more support. I think there's a lot of fear out there about the whole thing; people are very concerned about doing it right...

also;

QCA need to get together and discuss a curriculum ... at the moment it's so broad and massive, it's absolutely frightening and if you don't like ICT or aren't very confident with it, it must be an absolute nightmare.

(Interviewee 4)

This does not sit well with the DfES (2005) (Literature Review Section 2.4) suggestion that teachers will build their own “...individual and collaborative learning packages.” Teachers will not be able to do this when they feel so uncertain about what they are doing and their constant cry of not having sufficient time. Yet one teacher said that there were;

...interesting ways of using ICT to assist learning that could slot in easily with the curriculum without too much changing of plans and re-jigging so that, you know, it could be on a topic, if you do this topic right you just jig that in, it'll take you two minutes, you've got that in.

(Interviewee 2)

One of the interviewees felt that what was now required was control of the curriculum giving back to the teachers.

I don't think teachers feel in control and I think we need to feel in control of the curriculum again. We need to feel some sort of stability...

also;

I think we need to regain control and feel a sense of control of what's going on.

(Interviewee 4)

What DfES (2005) suggest (Literature Review Section 2.3) is that teachers explore new approaches to their teaching, as tradition methods have failed to deliver. What the respondents to the interviews were saying was;

...there's very little experimentation or exploring of new ways of thinking because it's just so busy,

also;

...teachers are too worried, chasing their tails really to be able to be aware of what can happen. I think teachers are just making sure that they can do what they've got to do really.

(Interviewee 4)

...they're aware but I think they still lack confidence.

(Interviewee 5)

Table 67 - How many teachers feel that there is very little experimentation in pedagogy when using ICT

Gender	Male	% Male	Female	% Female	Total	% Total
Number of teachers feeling that there is very little change of pedagogical experimentation	2	50	3	50	5	50
No mention of pedagogical experimentation using ICT	2	50	3	50	5	50

Table 67 would suggest that teachers are divided as to whether there is a change in pedagogy brought about by the use of ICT. It would appear that the use of Interactive Whiteboards have brought about greater change in pedagogy as these quotes illustrate;

... a lot more use of the interactive whiteboards, I think the children are getting more involved because the interactive whiteboard allows the children to do that.

(Interviewee 10)

...It's more visual so certainly it gets the attraction of the visual learners.

(Interviewee 6)

...in terms of interactive whiteboards that's been really important ... it's meant that children have been totally focussed on new sessions.

(Interviewee 4)

I use ICT and Smart programs in particular to present ideas in Design and Technology and other subjects, so I can make a slide show of images, say Google images, which have captions to reinforce learning.

(Interviewee 3)

...working with a group and they can come up and be learning, and it's not like if you get something wrong and a teacher will tell you off, it's bright and it's fun and it's like playing a computer game at home which they like doing. And they are learning it, and its just that, it's just fast and it's bright and it's fun, so it keeps them engaged ... so if we're stood at the front, you know, after about five minutes, they're losing concentration so with those it keeps their attention because you can just flick on this and this comes up and plays ... it is just quick and you press this and something comes up and they really enjoy it and it's bright...

(Interviewee 2)

Are teachers using ICT in their Design and Technology lessons? Figure 68 shows that the majority of teachers claim they are using ICT during Design and Technology lessons. Of the male interviewees, 75% say they are using ICT in Design and Technology while only 50% of females are use ICT in their Design and Technology lessons. This gives a 60% overall total. Table 68 does not specify how ICT is used.

Table 68 - How many teachers use ICT in Design and Technology

Gender	Male	% Male	Female	% Female	Total	% Total
Number of interviewees who use ICT in their Design and Technology	3	75	3	50	6	60
Number of interviewees who do not use ICT in their Design and Technology	1	25	3	50	4	40

The interviewed teachers gave these comments as to why ICT was, and was not used in Design and Technology;

...there are other priorities. Design and Technology is always down the list when it comes to it... not a high priority with teachers either.

and;

I think they're frightened of it. I think they're frightened of Design and Technology full stop.

The interviewee also thought that using;

...Spreadsheets, modelling and we've got PowerPoint and others, Flow All and control systems, so we are allocated our QCA schemes for our year group so I know I then integrate into my other curriculum areas so that I know that I'm covering those, but I don't necessarily teach it as an isolated ICT, mine's very much cross-curricular.

(Interviewee 6)

...particularly in technology from a design process we use various design programs and this gives them more of a professional perspective on what they're doing...from their research perspective they can use the internet for research...they can improve their products by using CAD/ CAM procedures...

(Interviewee 7)

Teachers claimed that ICT was used for research (both on the internet and from CDs), control, 2D designing, spreadsheets, word processing, digital photography, videoing and presentation of information during Design and Technology lessons (Table 69). Male teachers (50%) used ICT mainly to make presentations of images and in designing; it could be that male teachers enjoy putting together a visual stimulus, which could explain why males use ICT in Design and Technology more (Table 68). Only 25% of male teachers used ICT to research and no male teachers used digital photography, word processing and spreadsheets. The female teachers have a much wider spread of usage and in greater numbers than their male counterparts. For example 84% of female teachers used ICT for designing, 67% for digital photography, 50% for research and word processing and 17% for spreadsheets and

presentations. This could be explained by the fact male teachers could have a limited view of the use of ICT in school; more than they are willing to acknowledge, again this is a possible area for further research.

Table 69 - How interviewees use ICT in Design and Technology

Gender	Male	% Male	Female	% Female	Total	% Total
No of teachers						
Internet and CDs for research	1	25	3	50	4	40
Not mentioned	3	75	3	50	6	60
Designing	2	50	4	84	6	60
Not mentioned	2	50	2	33	4	40
Spreadsheets	0	0	1	17	1	10
Not mentioned	4	100	5	83	9	90
Word Processing	0	0	3	50	3	30
Not mentioned	4	100	3	50	7	70
Digital Photography	0	0	2	67	2	20
Not mentioned	4	100	4	33	8	80
Presentation	2	50	1	17	3	30
Not mentioned	2	50	5	83	7	70

Some teachers suggested that ICT was not used in Design and Technology lessons for a number of spurious reasons;

...Design and Technology as far as I am aware we haven't got any specific programs.

and;

If you're akin to doing Design and Technology or you're not akin to using ICT either. It's a frightening situation with a whole class.

(Interviewee 6)

...it's down to the practicalities again. That if you've got a class of 30 children you can't carry out Design and Technology in a computer suite whatever you're doing because if you're using glue, bits, saws no matter what, that's obviously out of the question, and if you've got 30 children with one computer in a classroom you're always on a queuing system so they don't get there.

and;

If you could do ICT and Design and Technology in the same room it might work, but junior schools just aren't set up for that.

(Interviewee 3)

In a junior class, children generally do most of their work in their particular classroom; only in middle schools do they have specialist rooms, although some primary schools now have a computer suite or have laptop computers on trolleys. As one teacher also put it;

...they were doing their research part (of the Design and Technology lesson) in the ICT suite.

(Interviewee 1)

There was only one school that did not use IWBs during Design and Technology. The school has IWBs in all the classrooms but they are not used in Design and Technology, no particular reason was given for this. The other schools used the IWB for their research or building images and presenting a slide show, while another also combines a number of worksheets and presents a large version on screen.

Most teachers appear to be using ICT in their Design and Technology lessons and for a variety of different purposes, but there is a great deal of anxiety as to whether they are using pedagogy that is appropriate.

5.3.8 The Future

The teachers who were interviewed seemed to have very similar views of future developments in ICT. None of the male teachers wished for Interactive Whiteboards, while 67% of female teachers wanted IWBs.

Table 70 – The number of Interviewees and their thoughts for areas of future development for ICT

Gender	Male	% Male	Female	% Female	Total	% Total
Future Development						
Wanted IWBs in all classrooms	0	0	4	67	4	40
Not mentioned	4	100	2	33	6	60
ICT suite with individual computer	1	25	0	0	1	10
Not mentioned	3	75	6	100	9	90
School networked	1	25	3	50	4	40
Not mentioned	3	75	3	50	6	60
Technician	1	25	2	33	3	30
Not mentioned	3	75	4	67	7	70
Individual/two to a computer	2	50	4	67	6	60
Not mentioned	2	50	2	33	4	40

Table 70 indicates that 40% of those interviewed wished to have IWBs in every classroom;

...think we'd all have Interactive Whiteboards and computers linked up with the training.

(Interviewee 6)

... we'll go for whiteboards as soon as we can

(Interviewee 9)

I think that the more types of systems like the Interactive Whiteboard that we can utilise in school the better.

(Interviewee 9)

This figure is distorted as four of the schools were already fully fitted with interactive whiteboards. Only one interviewee 'wished' for an ICT suite where every child had their own computer.

Three of the interviewees said that by having IWBs in the classroom would eliminate the need for an ICT suite.

...I think we'd keep our Smartboards, I don't know we probably wouldn't need a computer suite then.

(Interviewee 2)

None of the female teachers wished for pupils to have an individual computer within a computer suite, while 25% of males did. The table indicates that 40% of the interviewees wished that the school could be networked but again this was a distorted figure as five of the schools were already networked.

...school learning networks...useful in keeping those contacts together. People sharing practice and not necessarily having to go to meetings all the time.

(Interviewee 10)

...to be on a big network with other schools

(Interviewee 3)

Surprisingly, only 30% of interviewees asked that every school had a technician to solve their problems. Again this result was distorted as three schools had a full-time technician and one school had a part-time technician: 25% males and 33% female teachers asked for a technician. Of the interviewees, 50% (in an equal split by gender) felt that in the future every child would have some kind of laptop on their desk or a palmtop that was faster and cheaper than hardware now. They felt that;

...in the next 10, 20 years I think they'll (pupils) all have a palm top

(Interviewee 5)

or;

... (the pupils) were connected up to what she (the teacher) was doing, she could bring up somebody's work on hers (Screen)...

(Interviewee 2)

also;

...I do think it will be that children have their own laptops.

(Interviewee 9)

and I;

...can see that it'll come to the day when you'll have all children sat down at a desk with some form of ICT instantly available to them.

(Interviewee 3)

As hardware becomes cheaper they could regularly update their machines. Pupils would have access to their time-table and syllabus, while their homework would be done on their palmtop.

The teachers did not have any radical views on how the future would change using ICT. There was no mention of how new technologies could assist in teaching and learning. Their views were rather restricted to technology that is available now and offered; no ideas of what the future could look like. This could have been because they were unaware of the current use of current technologies or were not interested in ICT development.

5.4 Focus Group Interview

5.4.1 Structuring for Inset in the two LAs

The two LAs were very aware that they needed to keep their teachers informed of developments in all areas of the curriculum; although they used very different approaches to solving the problem. The management structures within the two LAs were very different for their school inspectors. The Inspectors gave the reason for this difference in the management

structuring as being the individual LAs using their central government funding in different ways.

Monies once devolved to LAs for training and Individual Professional Development of teachers has largely now been directly delegated to schools (Literature Review section 2.1). Thus one of the LA officers stated that;

...LAs do not have the capacity, as we used to as a local authority, to actually lead and pull networks in a way as we used to.

In Authority A the inspector explained that they had a full curriculum team of subject inspectors, who were also school contact officers. These officers, he explained, did inspections, delivered Inset courses to teachers as well as consultations with schools both in and out of the authority. Assisting the authority inspectors were a team of ASTs (Advanced Skills Teacher) who are "... starting to pick up and do some of the kind of networking roles." The authority's inspector went on to say that this type of structuring for LA inspectors may not have any longevity as there were funding implications for this type of model and that the authority should be looking at a different type of management/inspection system for structuring its officers.

Authority B inspector explained that they had a small core of ICT advisor/consultants and any subject Inset was bought in from other LAs or from specialist consultants. The brokering for its courses was done through a designated officer within the authority, who happened to be him. He used different 'pots' of monies from which to fund the training such as: central government, various trusts such as IST (International Software Technology) and 'Set Point' (A Partnership between education and industry) and monies schools were prepared to release for training. From these monies he would buy not only consultants from other LAs but also private specialist consultants and specialist colleges. The Authority also uses the specialist

colleges to build networks, using them as specialist training centres. The authority also uses VLEs (Virtual Learning Environment) for each curriculum area as a means of providing support for teachers - but more especially for the subject coordinators. The Authority also provides, for both subject coordinators and groups of teachers and support from ASTs who will visit schools as requested. The inspectors are LA officers and therefore have influence, awareness and contacts both at local and national level, as well as feeding back to a variety of influential bodies.

5.4.2 Identifying the Perceived Needs and Drivers for Inset

Both LA officers agreed that;

...the great issue is finance and releasing teachers to attend courses.

This was due to the fact that;

...basically because the schools can't afford to release teachers to attend the courses and other things.

Yet schools have monies devolved to them for Inset. (Literature Review section 2.1 and Qualitative Data Analysis section 5.3.6.). The training and development of teaching staff is now solely in the hands of the school, so much so that there are;

...big issues around funding and what schools choose to spend their funding on, and on the knock-on-effect that this has around attendance and getting people out of school.

Again, both officers agreed that it was now the schools that set the training needs agenda. That agenda is driven by different issues from when the LA had total responsibility for training and development of teachers. For now;

...it's very much down to their (schools) needs and again, I suppose, it's down to the school's self-evaluation and what you are good at, and knowing what you need, and then the local authority brokering that support and helping you make the networks and connections, if you need them.

Schools are now prioritising their needs to match the ever increasing demands on and judgements of them through the core subjects. This then gives the core subjects precedence when it comes to funding courses. The officers also agreed that there is funding for the core subjects in schools which is used;

...to get teachers out of school to regular networks. The networks for core subjects are held in school time, which you might not think is a lot, but when you are expecting Design and Technology coordinators to give up their time at 4.30.

The focus within school improvement plans and within school improvement priorities is driven by core subjects...Foundation subjects are the poor relations.

What was also highlighted by the officers was the fact that both local but more especially Ofsted inspections drove the Inset programmes within the schools.

...the major consultancies I do tend to be based around Ofsted. So Ofsted go in, they inspect, and they know (the school) that they fail an issue with ICT in Design and Technology...the consultation I will do is related to Design and Technology and ICT...it's linking some issue that has been highlighted through Ofsted...it's the school's development plan so it's something they have got to act upon before the next Ofsted and be seen to act upon. So that's when the specific training comes in.

If there was an issue during the inspection then this becomes a priority within the school and thus a training need within the school.

It's all driven basically by inspection...In a recent Ofsted inspection of (LA name) primary schools; it has highlighted assessment in foundation subjects as an issue. In one or two (schools) they have highlighted Design and Technology as an issue, assessment in Design and Technology and that's when I get called in. So it's all driven by that basically, they have highlighted an issue through inspection, and then in the school it becomes a priority.

...and therefore funding follows, time follows. It goes up the list of priorities...but as soon as it is less of an issue, it drops again.

...and predominantly the school improvement priorities tend to be the core subjects, Literacy, Numeracy based.

There was no doubt in both officers' minds that published league tables were what were influencing schools' decisions regarding Inset;

...because of published tables...that's the obstacle you have to get over really. ...that's the crux of the matter.

Where they identify the priority and the need, and it doesn't tend to be around the foundation subjects or Design and Technology; we can have action plans, all around literacy and Numeracy targets but when you look at the broader curriculum, it's very rarely there.

An issue with regard to both Design and Technology and ICT is the fact that both subjects have the potential, as one officer put it, 'to go pear shaped' during inspection. Teachers therefore shied away from teaching these lessons during Ofsted inspections; therefore Ofsted, under the old framework for inspections, could not comment about Design and Technology as they did not see sufficient lessons being taught during their inspection to pass comment. This then gave rise to the fact that;

... there is no published data for Design and Technology in primary schools ...when I looked through the old framework, when they used to inspect the specific subjects, they obviously don't do that so you find that something like 80% of inspections said they did not have enough information to comment on Design and Technology because they didn't see it being taught.

The Design and Technology Inspector felt that there was a great deal of Design and Technology going on in schools but teachers are not confident with the subject area as suggested in Section 5.3.7. Not only did he think Design and Technology was an area where teachers did not feel confident, but that ICT was also an issue (Qualitative Data Analysis section 5.3.6). This could have been a missed opportunity by teachers for there to be more Inset to boost teachers' confidence, but nobody is going to risk having a 'bad lesson' just to promote Inset in Design and Technology; and yet it does not stop them from asking for assistance or attending the network meetings. It would appear that teachers do not attend because of other priorities within the school and a lack of time (Qualitative Data Analysis section 5.3.3. and 5.3.6).

5.4.3 Inset Delivery

According to Authority A's Inspector, Authority A organises Design and Technology courses that are generally free of charge for teachers to attend, because schools will not allow teachers to attend courses for foundation subjects that have a cost implication for the school (Qualitative Data Analysis section 5.3.6.). He stated that there is also a termly Primary Design and Technology network which is basically aimed at Design and Technology coordinators but is also open to any teacher to attend from within the authority. The agenda for these meetings, the Inspector explained, is set by the audience. In the last five minutes discussion takes place as to what the teachers would wish for in the group to cover in the next session. He indicated that the information, resources and handouts from the course or network meeting are taken back to school, cascaded down and disseminated amongst the staff during staff meetings (Qualitative Data Analysis section 5.3.6.).

Authority A, he informed me, also had a Resource Centre from where a variety of materials were supplied to the schools in 'activity boxes'. These boxes, he claimed, contained books, photographs, artefacts, etc. and also software applicable to the 'Topic area' the box was covering. This, the Inspector felt, was a powerful means of accessing the school to link Design and Technology with ICT without using QCA schemes of work, which he felt were still a 'crutch' to many schools, despite the introduction of 'Excellence and Enjoyment'.

In Authority B, according to their Inspector, support for coordinators of Design and Technology is assisted by VLE, ASTs, specialist colleges and 'buying in' of specialists from other LAs for network Inset, where specific training is asked for.

The work within Authority B appears to be more by peer support, with occasional outside input. The officers thought that the specialist colleges were trying to meet a part of their targets which are to;

...actually reach out to feeder schools and work within their communities.

The introduction of cluster schools, based around specialist colleges, enables training and the use of their specialist facilities to be given by colleague from Specialist College trainers. The officer implied that there is no expertise in primary schools, yet both officers agree there is a great deal of expertise in the primary schools.

...the networks are crucial for us for tapping into resources we have got in schools,

(Primary networks) actually bring people together to enable them to share their expertise and ideas.

This implication that specialist colleges colleagues have always have superior specialist knowledge gives an air of elitism to the high schools and somewhat 'dumbs down' primary

teachers. There was also an issue of progression from primary schools to high schools and the lack of coordination between them. The Inspector from Authority A claimed that;

...children who are using a drawing package who then go to year 7 and start again from scratch with a different emphasis.

This only emphasises that there appears to be a lack of co-operation between primary and high schools: which does not bode well for training based on specialist colleges. The Inspector claimed that there were some good examples for teachers from different phase schools working together. In some of the networks within Authority A, the Inspector reported that they were using 'Tech Soft 2D' package. In this example the pupils were able to build their designing skills all the way through the primary phase and then, he claimed, build on even more when they entered Year 7.

They were then able to access milling, laser cutting and 'Sticka' machines which the program also controlled. This, he felt, raised the knowledge, skills and understanding of the pupils prior to their entry to the high school.

The officer from Authority B felt that the training from the specialist colleges was a mixture of both skills and pedagogy. As he put it;

...it's skills development, it's understanding and looking at the learning potential of these elements but it is also looking at aspects of pedagogy as well.

This would imply that high school teachers are aware of primary practice and its pedagogy. The skills development crosses all key stages but the pedagogy does not. Many high school teachers are only familiar with their particular subject area and not the broad band of subject

knowledge, as set out in the National Curriculum, which primary teachers have to cover. Nor are high school teachers familiar with working cross-curricularly as they tend to be subject specialist unlike primary teachers who are encouraged to do so - especially with such reports as 'Excellence and Enjoyment'. The Inspector of Authority A acknowledged that in their primary network meetings that are;

... open to all teachers KS1, 2 and Early Years, but the hard thing is pitching it to all those teachers...what we were doing (at the time) was not appropriate for Foundation teachers...

If inspectors are finding it difficult to 'pitch' the Inset for the whole of primary section, how are high school teachers going to manage the primary pedagogy? The Authority B officer defended this by stating that;

...we have 35 ASTs, six probably, slightly weighted towards secondary but not much. We've got a good range of primary ASTs who work cross-phase KS1, 2...

Maybe the ASTs will work in conjunction with the high schools in providing Inset that has suitable primary pedagogy - but this was not acknowledged.

A few years ago in Authority B, planning for Design and Technology had been organised right through both school phases. This was originally done with monies from the 'Single Regeneration Budget'. These monies paid for both the training and equipment required for both primary and high schools. Pupils were able to use CAD programs and have their designs made in the high schools. This cooperation in both Design and Technology and ICT made the high school reflect upon its schemes of work for these subjects as the pupils were coming into the high school with far greater skills' knowledge and understanding than had previously been experienced. This then caused the high schools to re-think their schemes of work: raising the

pupils work to a higher level of all-round ability (Literature Review section 2.3., 2.4. and Qualitative Data Analysis section 5.1.1).

The Inspector for Authority A stated that;

...this is the kind of thing we are trying to get off the ground.

The restriction for this model not being widely copied and implemented all over Authority A was again funding, as the authority did not have sufficient monies for the initial input required by them due to the funding arrangements from central government (Literature Review section 2.1).

It was felt by both LA officers that the principal way teachers could keep abreast of ICT developments and be able to effectively use the technology, was to attend network meetings in their own time. Both officers agreed that this was unfair, in the light of core subject coordinators getting both time off during school hours and schools more willing to fund core subject training. But this was out of the officers' hands, who also felt that this situation did not level its self to a broad and balanced curriculum in the schools. This was because Headteachers appeared to give more credence to the core subjects because of National Tests and their published results.

Both officers felt that there were a nucleus of teachers attending network meetings but, in comparison with the number not attending, they were only reaching a very small proportion.

...they're the tip of the iceberg really in terms of the other schools that are not attending other networks, they're not having that input, not seeing what is available, what is being developed in terms of ICT for the subject area. It's how do you get it across to them?

There are certainly some really good HUBs networks out there... there's certain areas that haven't seen the light of day or engaged. We work hard as an authority not only to, to make accessible as much as possible but also to engage as much of a wide audience as possible.

The officer from authority A was concerned that schools were becoming insular.

...schools are becoming more kind of, apart from things like primary networks...they are becoming very insular places.

Both officers felt that it is only by schools working together through the primary networks and sharing their expertise that they will be able to keep pace with the developments in technology and its implications for teaching and learning (Qualitative Data Analysis section 5.3.6.).

The officer from Authority B was convinced that the use of VLEs was the way of raising teaching staff awareness of issues, but he did have a concern regarding;

...the number of staff who access them and how often they access them.

There was also agreement between the officers that the loss of a regional advisors' group was indeed damaging to the position, retention and advancement of the subject. As many Design and Technology advisors had now moved roles within their authorities, losing any involvement with the subject also contributed to this parlous state.

The Inspector for Design and Technology acknowledged that there was a plethora of software which was not easy for teachers to understand and use effectively.

...it's something you've got to get your head around...you have less and less time to get their heads around the software to feel confident, confident enough to sit in front of a class of year 5 or 6 kids and take them through it.

He also acknowledge that there were difficulties for primary teachers using specific software programs, in that they may only use them for a few weeks per year due to them being specific to a 'Topic' and then not use the program again until the 'Topic' the following year.

... a two week slot that you teach it and you are not going to use it again until the following year, and in that time you've forgotten unless you use a piece of PC software on a daily or weekly basis, then you are not going to know the 'ins' and 'outs' of it...

Yet when using IWBs which teachers do on a daily basis - he also felt that primary teachers were only “*scratching the surface in terms of the potential of the whiteboards.*” Teachers were only using ‘Word’ based activities or using graphs and charts with a few PowerPoint presentations, all of which needed to be more interactive. Yet the teachers felt that they were being very interactive with the use of IWBs (Section 4.1.3).

Yet there are LA specialist consultants in both authorities who have been ‘rolling out’ the training for the IWBs. The authorities had struck a deal with the manufacturers in so much as they would buy the IWBs but would supply their own training.

The officers thought that every school’s staff should be getting training from the LA consultants - but this did not appear to be what was happening in the schools from my semi-structured interviews (Qualitative Data Analysis section 5.3.4 and 5.3.6).

This training also applies to the officers themselves, a lot of whom have been going into schools to deliver training and cannot operate an IWB. If LA officers cannot operate IWBs and have had to have intensive training, on an LA directive, to ensure that the new technology gets used during their training sessions it shows what difficulties there are when trying to keep up with the fast moving world of ICT. This also has implications for the class teacher (Qualitative Data Analysis section 5.3.6.).

One way that the Design and Technology Inspector suggested for teachers to keep up to the fast pace and ever changing face of ICT, was to do what secondary schools did and buy the DATA (Design and Technology Association) magazine. The magazine, he claimed, has the latest developments in ICT technology, as well as exemplar work from both primary and

secondary schools which would allow primary teachers to see practical examples for the use of the technology. The Inspector thought that maybe primaries did not subscribe to the magazine because of the expense to the school.

Another suggestion, by both Inspectors, was that primary teachers go to the British Educational Communications Technology Agency's (BECTA) show, which many secondary teachers attend annually. Again this enables teachers to "*get up to speed with what advances have been made, what new software and hardware is out there.*" Again he felt this was an issue due to the lack of funding to enable teachers to attend even in their own time at the week-end. This was due to Design and Technology being a foundation subject and consequently being '*sidelined*'.

The only time, both officers agreed, when foundation subjects seemed to get any quality time was after SATs. This was when schools "*take on a bit of art, a bit of Design and Technology and this kind of stuff.*" Teachers feel they can allow pupils to be more creative when the pressure of SATs and the consequential league tables has been removed from the classroom environment.

5.4.4 The way forward

The Inset courses that have been over-subscribed in Authority A have been for courses that linked subject areas. This the inspector described as "*...going back to, most would call it 'Topic Work'.*" This has been due, he thinks, to schools taking on board "Excellence and Enjoyment" and moving away from the QCA schemes of work which he claimed are too prescriptive. The content of his courses, he claims, have fitted in with the schools' agenda of building new projects, which link such subjects as Design and Technology and History or

Design and Technology and Music and gives the opportunity for the Inspector to “...give other messages that I want to get across regarding Design and Technology and sharing of information with teachers.”

In Authority B, the Inspector claimed that they have had funding for ‘Creative Partnerships’. These partnerships were for “making the curriculum more creative.” The partnerships were based around having more “creative approaches to teaching and learning with elements of ICT, art, music, dance, drama and aspects of Design and Technology and Humanities.” The Inspector highlighted the fact that unfortunately the funding for these partnerships will be unsustainable after 2008. The Authority wants to move teaching and learning in this direction, as they feel it is a far more stimulating curriculum, but the Inspector stated that there is the issue for the schools of Ofsted inspections and maintaining the core subject standards. The Authority felt that even with the limited time those schools had to develop this type of teaching and learning, they would have at least had the opportunity to look at different ways of delivering the curriculum, whilst having Authority support.

5.5 Summary of interviews

5.5.1 Teachers

Teachers are very aware of the advantages and benefits that ICT brings to the classroom. They can see the advantages it brings for pupils both in their work and attitude (Section 5.1.1., 5.3.1.) Teachers are generally supportive of the use of ICT within the curriculum but they lack guidance and understanding of the pedagogy, whilst also lacking the skills, foresight and capability of using ICT confidently (Section 5.3.6.) Teachers are feeling pressurised by both

time and the rapid developments within the world of ICT. They generally feel that there is such rapid expansion in ICT that they cannot keep pace with the developments in both hardware and software. They do not even have the time to get familiar with the programs they already have, so looking at new ones becomes even more of a challenge. Therefore they use the programs they are familiar with (Section 5.3.3). Yet there is not the funding coming from the schools to support teachers who are genuinely interested in the foundation subjects and wish to incorporate ICT into them. ICT is a fast moving area and needs constant training to keep pace with its developments (Section 5.4.3.) It needs both time and money if it is to be successfully integrated into the curriculum in an effective and supportive manner for teaching. It would appear that this is not being done; and yet ICT could assist and develop education in a most dramatic manner (Section 2.3). It would appear that schools are missing great opportunities to move education on into the 21st. century. This could be due to lack of foresight or awareness on the part of the headteacher or it could be lack of funding (Section 5.3.5). Certainly there needs to be some input from central government to ensure that ICT skills are at least keeping pace with developments. Teachers do want the skills and pedagogy for using ICT as their enthusiasm with IWBs has shown (Section 5.3.4.). Again, the lack of consistency in IWB training would seem to highlight these problems; the training for IWBs would appear very patchy as the interviews have revealed that throughout both authorities this is an issue (Section 5.3.6).

5.5.2 LAs' Response

Both the LA officers felt that their Authority was giving full support to all teachers for training whilst still recognising that there was some inconsistency, but not with IWB training. This could be due either to the headteacher not allowing staff to have time off during the day

that there is a subject bias towards core subjects within the school regarding who gets the training first. There could also be a lack of funding for CPD within the school (Section 5.4.3.).

This issue of inconsistency could be where the strong leadership and vision from the headteacher becomes essential in developing ICT within the curriculum. The headteacher needs to ensure that all the staff are aware of their support and that they wish to develop the use of ICT within school in a cross-curricular manner: and that the staff feels confident about teaching and using ICT (Section 5.3.5.). The majority of interviewees felt that their headteachers were supportive - but yet the overwhelming majority still do not feel confident about using ICT nor, despite their wishes, do they use it in a cross-curricular manner (Section 5.3.7.).

5.5.3 Time

The dilemma of time seems to be only solvable by teachers spending more of their own time. It was felt by the LA officers, that if teachers attended the network meetings then they would be able to keep pace with the developments within the subject areas. That would appear to be difficult to explain to over-worked, time-stretched primary classroom teachers (Section 5.4.3.). The result will be what the officers have already discovered - non-attendance at out of school hours courses. It would appear that the only way to raise attendance at Inset courses is to:

- raise the funding for primary schools
- provide courses that both schools and teachers need
- courses that are relevant to their school improvement plan or their forward curriculum planning not for raising SATs or league table results (Section 5.4.3.).

Pupils should have a broad and balanced curriculum. This apparently is not happening due to divisive published data about the school (Sections 2.2. and 5.4.4.).

The use of VLEs is using technology to solve a problem but not all teachers will be comfortable with its use or its application. This was one of the issues with teachers - their lack of vision for the use of ICT in the future. By using technology themselves, the officers can model their use, such as with the IWBs within Authority A. The LA officers' other solution to this issue was to attend exhibitions such as BECTA's and subscribe to DATA (Sections 5.4.3., 5.4.4.). Again this seemed to come back to the two issues of time and funding within primary schools. Primary schools appear to be limited with their funding for Inset, compared to secondary schools; the way the formula is set for the primaries-devolved Inset Monies does appear to be a constraint (DfES, 2003e).

The use of specialist colleges and ASTs could cause problems when delivering pedagogy to primary teachers. As already mentioned before, secondary teachers are always not familiar with the practice of the primary sector, especially the Foundation and KS 1 stages. If LA inspectors find designing Inset courses that cover all aspects of KS1 difficult, then this could be problematic for KS 3 and 4 teachers (Section 5.4.3.). The use of specialist colleges is a central government solution for the LAs, who are no longer driving training forward as they used to do. The LAs are very aware of their lack of support and leadership in the matter of training and CPD. They now see themselves more as 'brokers' in setting up Inset courses (Section 5.4.1.).

Networks, the LA officers feel, are going to be a powerful method of maintaining Inset and CPD but they are so dependent on individuals, who were not employed to give this type of training, as well as Network group pressure to move things forward. The training may vary in

quality greatly across an Authority. If it was the Authority that controlled the training then there should be more consistency (Section 5.4.3., 5.4.4.). LA officers are also at the centre of both LA and central government policy and directives; feeding back at both local and national level. The LA is in a much stronger position to understand and formulate more appropriate training rather than a full-time teacher in a school.

It would appear that the biggest influences upon a school's choice of training for its staff are: 1) National Curriculum test results, 2) Ofsted and LA inspections and 3) the published league tables (Section 5.4.3.). This information is in the public domain and, it would appear, has led to schools focusing solely upon the core subjects, as these subjects form the basis for the majority of the information. The focus on the core subjects is not giving a broad and balanced curriculum. Ofsted also publish their results with emphasis on the teaching and learning in the core subjects. It is quite understandable why headteachers are focusing on the core subjects when they will be judged against this limited and often artificial report of the school and its staff (Section 5.4.3.).

Yet ICT could greatly assist in developing the school curriculum to a higher level while giving the broad and balanced curriculum the primary school needs (Section 2.3.). To achieve this, the school needs to understand the change in pedagogy for learning with ICT. (Sections 2.5., 2.6. and 2.7.), headteacher need to provide vision and commitment (Section 5.3.5.), Ofsted should support and encourage this change in teaching and allow time for the changes to establish themselves (Section 2.4). This is all reliant upon central government allowing time and monies to establish a curriculum for the 21st century using ICT.

5.6 Further Analysis

5.6.1 Different LA structuring

Both Authorities' management structures were organised differently as reported in the earlier part of this chapter (Focus Interview Section 5.4.1). This was due to central government re-organising monies for INSET and CPD (DfES, 2003e). Authority A had a structure which was in place previous to the capitation changes. The Authority has continued to use this structure and allow ASTs to “*pick up*” some of the work as they ‘*supported*’ the subject (Focus Interview section 5.4.3). Both officers conceded that this management structure could not continue due to central government’s funding changes not being sufficient for them to continue to support their structure (Section 5.4.1.).

Authority B had re-organised, cutting many subject inspectors from its management structure, buying-in and using specialist colleges to provide the training. With the shrinking of subject inspectors in other LAs (Focus Interview section 5.4.3), especially in Design and Technology, then the specialist knowledge, understanding and appropriate pedagogy of the subject will not be being passed onto Key Stage 2 classroom teachers. It would appear that eventually this will lead to a narrowing of the curriculum and not the ‘Broad and Balanced’ curriculum that was originally stated in the National Curriculum (Literature Review Section 2.1). While primary education is the foundation stone on which central government is building its ‘information society’ (Introduction Section 1.1), there is a lack of support for a ‘Broad and Balanced’ curriculum. The majority of monies for INSET are now being devolved directly to the schools (Section 5.4.1., 5.4.2.). The monies for Core subject courses and the payment for release-time of teachers to attend INSET for core subjects is decided by the school or is paid by central

government. But there is no such funding for foundation subjects, of which Design and Technology is one.

5.6.2 Differing perspectives between school management, teachers and LA

It would appear from this research that school management, teachers and LAs, whilst working for the good of the pupils, all have different perspectives regarding what INSET and CPD should be delivering (Sections 2.8., 5.3.6., 5.4.3., 5.6.4.). The schools' management appear to want success as viewed through their inspection, National Curriculum Tests and league Table results so therefore they only support INSET that deals with core subjects as the school is only judged by the results of the core subjects. The teachers still want skills, knowledge but mostly pedagogy for using ICT in the classroom, while having very little time to achieve this. The LAs want to encourage a 'Broad and Balanced' curriculum while realising that they have limited resources, funding and non-attendance of the majority of teachers to their foundation subject courses. The 'bringing together' of foundation subjects, as described in Authority A, and the introduction of 'Excellence and Enjoyment' documents has, it appears according to Authority A officer, encouraged teachers to attend foundation subject INSET (Section 5.4.3.). Networking in both Authorities appears to be working although there appears to be two different methods of initiation: Authority A having physical meetings, while Authority B uses both physical meetings at the specialist colleges and ICT technology for people to meet electronically, although the officer in Authority B having some doubts as to how much this is really used (Section 5.4.3).

5.6.3 Narrowing of the Curriculum

Teachers appear to want a 'Broad and Balanced' curriculum as highlighted in Authority B where they have 'Creative Partnerships' (Focus Interview section 5.4.4) until either the funding runs out or an inspection looms, and in Authority A where quality time is given to foundation subjects after SATs (Focus Interview section 5.4.3). The fact that Authority A is now facilitating INSET which is described by the LA's officer as 'Topic Work' and is experiencing an over-subscription of its courses indicates that there is interest from the teachers to have a 'Broad and Balanced' curriculum. Both the LA and the teachers realise that this type of curriculum is far more stimulating and creative than the narrowing down that appears to have occurred in recent years.

5.6.4 Emphasis on core subjects

The narrowing down of the curriculum has led to Mathematics, English and to a lesser extent, Science becoming the major time consumers within the primary school classroom (Section 5.4.4.). The reason that this has occurred is due to inspections from the LA, Ofsted and HMI concentrating upon what they term 'the basic subjects' or 'Core Subjects'. The schools' managements are well aware of the power of the media and what it does for reputations; therefore school managers are focused upon the results of these inspections, tests and tables to allegedly establish whether they are being effective with their teaching and learning, which goes into the public domain (Section 5.4.3., 5.4.4.).

5.6.5 The implications of Tests, League tables and Inspections

No one wishes to be seen as a ‘failure’ or not doing their job effectively. Tests, inspections and League Tables are the central government’s way of measuring the quality of teaching and learning in our schools (Section 2.1., 2.2.). What they do not do is cover the broad base of the foundation subjects which help give a creative, interesting and a ‘rounded’ pupil (Section 2.1.). This is reflected in the teachers that are released during teaching time to attend INSET. The core subjects take preference over the foundation subjects. Teachers are slowly returning to INSET training in their own time for the foundation subjects (Section 5.4.3.). Not all pupils are academic. Some are more practical but the narrowing of the curriculum can only discourage the practical pupil. Pupils do need to ‘know the basics’ but they need to see a reason for why they are learning (Section 2.3., 2.4., 2.5.). Narrowing the curriculum will only alienate these pupils, make them become disenchanted, troublesome and discontented with their education. This could lead to teachers having a much more difficult time teaching the class, which in turn will lead to a lowering of the aforementioned results.

CHAPTER SIX

6. CONCLUSIONS AND RECOMMENDATIONS

6.1 Conclusions

Generally there has been agreement between the teachers, LA officers involved in this research and other research findings, although throughout this piece of research there have been a number of issues that have repeatedly been raised by both teachers and LA officers (Sections 2.4, 2.5., 2.6., 2.7., 4.1.4., 4.1.5., 5.1.1., 5.3.1., 5.3.2., 5.3.3., 5.3.5., 5.4.2., 5.4.3.). Even when the LA officers involved in this research were aware of the issues but could do very little about them, they were concerned as to what they could do to help teachers (Section 5.1.1.). In other areas there have been differences of opinion but these have been few and far between and are discussed below.

6.1.1 Areas of agreement

The teachers involved in this research have similar views to those noted in other research findings, in that there are benefits from using ICT in both teaching and learning (Section 2.3., 5.3.1.). The pupils become more enthusiastic, engaged, focused, give more effort; they achieve a higher standard of work and produce higher quality finished products, whilst their behaviour also improves (Sections 2.3., 5.1.).

The ICT skills and program knowledge are also transferable to other areas of the curriculum, although teachers are not taking advantage of this yet. (Sections 2.6. and 5.1.2.). There are no significant differences in computer usage when comparing either teachers' age or teaching

experience. This should ensure equal opportunities for pupils' access to ICT. The largest group of non-users are the 31 to 40 year olds group, who were themselves still at school when computers were first being introduced into schools. They were put off by the computers' unreliability and slow speed, but their attitude is now changing and they are beginning to embrace computers. This change in attitude will bring about a transformation in pupils' perception of ICT and their opportunities for learning. Nor was there a gender issue or difference regarding computer usage; indeed females were proportionally higher users of computers than male colleagues (Sections 4.1.1., 5.3.1.).

There was wide support from headteachers and senior staff for the development of ICT within their schools. Headteachers involved in the research were including ICT within their School Improvement Plan, while some headteachers were making ICT skills a part of individual target setting for staff. Rolling programmes were being devised so that hardware could be regularly up-dated to keep pace with the ever increasing changing world of ICT and replace worn-out equipment (Sections 2.4., 5.3.1., 5.3.5.). This will ensure that all pupils will be given opportunities to enhance their learning through ICT across all curriculum areas.

A number of major issues were raised by the teachers. They were training, time and pedagogy when using computers. These three issues are now dealt with separately.

6.1.2 Training

The LA officers involved in the research spoke of their dilemma regarding their now limited ability to provide CPD they consider necessary “...LAs do not have the capacity, as we used to as a local authority, to actually lead and pull networks in a way we used to.” (Section 5.4.1.). They were well aware that teachers' needed continuing support and assistance in

continuing to develop their skills, knowledge and pedagogy regarding the use of ICT for teaching and learning. It would appear that the major controller for the individual INSET budget is now the schools (DfES, 2003e). As they control the monies, they decide what type of training they require, who will go on the courses and the types of courses that the LAs in the research will provide by virtue of paying for staff to attend the courses. The LA officers involved in the research stated that the majority of courses which are provided in school time tend to be for the core subjects of the National Curriculum (Section 5.4.3.). They further stated that headteachers are only too willing to let co-ordinators attend in school time as the headteacher is concerned with the public standing of their school, which is based upon various types of inspection, summative assessment results and comparative tables, all of which are based on the core subjects (Section 5.4.2., 5.4.3.).

There is not the INSET training of teachers for a 'Broad and Balance' curriculum, nor, it would appear, is a 'Broad and Balanced' curriculum being taught. The focus, it would seem, is on the core subjects to the detriment of everything else (Section 5.4.3.). This is far removed from the intentions of the National Curriculum which does state that there should be 'a broad and balanced curriculum' (Section 2.1). The LA officers were well aware that schools concentrate upon the core subjects at the expense of the foundation subjects; that time-tables are altered when inspections take place and that 'other subjects' that are the foundation subjects, are taught when SATs have taken place (Sections 5.4.2. and 5.4.4.). This is to ensure that the school gets the best possible results and thus be regarded favourably by all concerned. Why should this be so important to central government? Is it because they can seek to claim to have raised the standards of education through looking at these narrow results? Is it so that central government can control education without appearing to accept any of the responsibility should things going wrong – "it's the teachers fault, we gave them what they

needed” – would be the cry. “Look at how we have raised standards through the League Tables and SATs results” - is the current acclamation. This part of Estelle Morris’ (DfES, 2007a) speech to the Social Market Foundation shows how the government is taking acclaim for raising the standards in education;

The extra resources we have made available to schools will increasingly enable heads to shift their attention from day-to-day fire-fighting to the development of management strategies tailored to local circumstance.

She also acknowledged that;

Our literacy and numeracy strategies, and policy on infant class sizes, have been key strands in our new national framework. They have had a transforming effect on teaching in primary schools. They have equipped teachers with the tools to carry forward their front-line task of raising standards of pupil achievement.

(DfES, 2007. Accessed 18/6/2007)

Education is more complex and complicated than the results of a few tests, their results and school inspections. It is about pupils achieving their potential, wanting to learn, raising pupils’ curiosity, widening their horizons and teaching them how to learn through participation and encouragement (DfEE, 1999; Oliver 2001).

Both the research findings, from those teachers questioned who took part in the training, and cited in the literature (Ofsted 2004) suggest that the NOF training was not fully considered, it was rushed and now viewed as a ‘quick fix’. Central government did not understand the complications and changes that the use of computers would bring to the classroom. The NOF training viewed the use of computers as merely a complicated ‘skilling-up’ exercise. The NOF training has not been a great success, as stated by Ofsted (2004) (Section 4.1.4). The majority of teachers questioned and interviewed all thought that it was a waste of time and

money. It is only when the school management took an active part in the training that there was any success. The training has been reported by Ofsted (2004, 2005b) as being ‘over ambitious’ and they further suggest that the training was insufficient and ‘not of the right type.’

The research findings appear to suggest that now teachers have had time to ‘play’ with their computers and the programs, they are beginning to understand what they can do. Cummings (1998 cited in Fletcher 2006) said that teachers needed time to come to terms with this new technology and it would appear that this has happened. It was reported by teachers in the semi-structured interviews that they have made sudden and tremendous leaps forward in their use of computers. They are beginning to understand the technology and how it works. This has been highlighted by the introduction of IWBs which has been met with wide-spread approval (Semi-structured interviews. Section 5.3.4). Yet teachers were concerned that this was just more new technology they were going to have to learn to use, but they quickly mastered the technology. This was because they understood how to manipulate a computer and how IWBs are apart of that system. They can see the benefits that IWBs bring for both teacher and pupil in teaching and learning. What they now require is pedagogical training on the use of computers and IWBs (Semi-structured interviews. Section 5.3.6).

It would appear from the semi-structured interviews, that the principal way of continued training in ICT for teachers is by the ‘cascading model’, where staff pass on information and skills to each other at staff meetings (In-house) or they ask each other for individual support in the classroom (peer training).

Peer support is being further developed by the use of Networking within each of the two authorities researched. Authority A uses a voluntary method of school pyramids working

together, which involves face to face meetings. Authority B uses an authority-organised networking system based upon Specialist colleges and electronic networking and VLEs. While teachers have to give of their time to attend the network meetings, Authority B's teachers do not have to travel. This networking system is envisaged by both LA officers involved within this research as the way forward for foundation-related subjects and indeed further training. This 'High School' down model discussed within this piece of research does raise concerns about pedagogy understanding of colleagues from different educational phases.

Authority A reported an upturn in attendance for courses that reverted to a 'Topic' based curriculum. Here subjects are banded together so that pupils see the inter-relationship between subjects. Pupils also 'research' during this teaching which enables them to use the information to problem solve, involving more "knowledge exploration" (Orlowski, 2005: 1), which is one of the key elements of the National Curriculum (Literature Review. Section 2.2). Pupils get involved, engaged in their learning and begin to take ownership of their learning - again a key element in the National Curriculum. This type of constructivist teaching and learning is advocated by many of the educational theorists in Section 2.4 of this research piece (Webb, 2002; McLoughlin and Oliver, 1999; NFER/Harris and Kington, 2002). Through the 'right type' of training which involves a pedagogical aspect (Becta, 2004), ICT can be of great assistance in this constructivist style of teaching and learning.

All this cannot happen without the support and leadership of the headteacher and senior management. The headteacher needs to have a shared vision where staff can experiment, as suggested within this research piece, (NFER/Harris and Kington, 2002; DfES, 2004c; Section 5.3.5.) even if things go wrong, but experimentation is clearly not happening according to the semi-structure interviews (Section 5.3.6). It would appear, from the semi-structure interviews

(Section 5.3.5), that when the headteacher was interested in ICT, then he/she took a leading role and the staff knew their vision for the use of computers within the school. (Becta, 2003c). It seems a little late to start to 'educate' headteachers in the benefits, pedagogy and usage of ICT at the SLICT training, when schools have been using computers for many years now (Ofsted, 2005e. Section 2.4) This could have enabled the senior management of the school to appreciate the benefits of using computers and how the pedagogy needs to be adapted for using computers, whilst also allowing teachers time to adapt to the new technology and for headteachers, senior managers and staff to learn together. This two day course is both too short and too late. No wonder teachers were unsure of how to effectively implement the use of computers - never mind how they worked! Had this type of course been run before computers were widely used in schools, then maybe more progress and a more sophisticated use of computers could have been embedded into our schools by now - as highlighted by Robertson (2002) in Section 1.7 and Ofsted (2005d) 'embedding ICT in schools'.

6.1.3 Time

It would appear from these research findings that time to become accustomed to computer programs and their application to pedagogy was the biggest issue (Section 2.4. Fabry and Higgs, 1997. Sections 5.3.3. and 6.1.3.). The LA officers who were involved in this research piece were somewhat critical of some teachers who were not prepared to give of their time to attend network meetings (Section 5.4.3.). These were intended to keep the teachers abreast of developments and for up-dates. This was somewhat ironic in that the inspectors in Authority A had to be directed to have training so that they could exemplify the hardware and software whilst giving their INSET courses (Section 5.4.3.).

Teachers are still concerned about the lack of time to understand the mechanics of using commercial computer programs (Section 5.4.3). They do not feel that they are able to understand the programs and then have to confidently teach using the program (Section 5.3.3.). This is why teachers tended to only use Microsoft programs, which are already loaded onto the computer and which both they and the pupils can understand what the program can do and are user friendly. Headteachers also want value for money so any programs bought had to be used. This piece of research suggests that complex programs require time to understand how they can be used effectively - something teachers were not prepared to do (Sections 5.3.3. and 5.3.5.).

The LA officers also understood the difficulty primary teachers have in only using a program for a few weeks and then not using it again until the following year. In effect they had to relearn how to use the program (Section 5.4.3).

The overload of central government initiatives and changes for schools to implement has given rise to greater and greater demands upon class teachers' time, never mind that of the management within the school (Sections 1.3, 2.1. and 2.2.). Now, it would seem, teachers are very aware of what precious little time they have to develop new initiatives and keep abreast of any new developments. This research suggests that teachers are becoming very discerning about what they use their time for; the core subjects and related class room paperwork seem to be taking precedence (Sections 4.1.2., 4.1.3., 5.3.3. and 5.3.4.).

6.1.4 Pedagogy

Teachers are now asking for further training to develop their pedagogy when using computers (Semi-structured interviews. Section 5.3.6). They now have got the ICT skills and knowledge but are still uncertain as to how they should teach using computers (Qualitative Data. Section 5.3.7).

It would appear that teachers are beginning to change their teaching style. This is apparent when they use IWBs. They are getting pupils involved, motivated, interactive and enjoying working with the IWB (Semi-structured Interviews. Section 5.3.7). In this research the LA officer from Authority A was critical of teachers' use of the IWB, because teachers were only using Word, PowerPoint, graphs and charts but this again is early days for some of the staff. They have not had the IWBs very long and with limited training in some cases. Again this research suggests that it is the time it takes to 'learn the way the technology works', which takes the time, as well as time to experiment and acquire the 'know how'. Teachers are working from a 'comfort' or 'safety zone' where they know what they are doing and are able to use the technology to enhance their teaching - not using the technology for its own sake. It will take time for them to change their pedagogy, as they are moving out of their 'comfort' zone. Their use of the technology in different subject areas will also be dependent upon their confidence and skill. Teachers will have to use a very different pedagogy, as discussed in the Literature Review (Section 2.4), which involves very different styles of teaching. The independent learning style, open-ended questions, working in pairs and researching as suggested by Wheeler (2001), Scrimshaw (2004) Holmes and Gardner (2006) and others (Literature Review 2.4, 2.6), was used in primary schools forty years ago. The current rigid teacher pedagogy has been brought about by the central government's insistence upon a set

lesson formula, in set subject areas using the National Curriculum, with inspections to reinforce this stance (Sections 2.1., 2.2.and 5.4.2.).

Teachers are well aware of the conditions for getting pupils engaged, enthusiastic and wanting to learn. They are aware of the Behaviourist and Constructivist theories where pupils are actively engaged, frequent practice in different contexts build skills, positive reinforcement is a motivator and there are clear objectives for what will be achieved. Where pupils are asked open-ended questions and have to build their skills for discovering information, they are then able to make judgements and draw conclusions from that information. This is using the information for learning, not just for the sake of learning the information. The skill of using information for problem solving is not confined to one subject area; it is transferable to all subject areas. Teachers want to engage pupils in high-level thinking, stretch pupils minds and reasoning, as required by the National Curriculum (Literature Review. Section 2.2, 2.6) but the pedagogy as insisted by central government does not allow for this. Yet teachers are attending INSET in Authority A where the learning is based on a Constructivist type of pedagogy. Teachers do not need training for this pedagogy. They just need the confidence and backing of some one in authority to reassure them to teach in a manner they know pupils will learn best.

6.1.5 Other issues

Teachers have reported both through questionnaire and semi-structured interviews that they and their colleagues appear to be more confident about using ICT (Section 4.1.4.Table 32, Section 5.3.6. Table 65), which is in-line with recent reports from Becta (2002c), HMI (2002) and DfES/Becta (2003d) and Ofsted (2004). When asked about using ICT to support the

National Curriculum, 80% of teachers said they were not confident (Semi-structured interviews. Section 5.3.7. Table 66). This could be due to the fact that teachers are now more confident in the skills of using ICT but are less confident when it comes to the pedagogy (Section 5.3.1.). The introduction of IWBs was initially viewed with suspicion but was quickly dispelled with the training and a much better understanding of the technical principles involved (Sections 4.1.3. and 5.3.4.). From the interviews it appears that teachers are beginning to apply ICT in their Design and Technology lessons. When it was used it was for a variety of applications and there were marked differences in how each gender used ICT (Semi-structured Interviews 5.3.7). Again there is a great deal of anxiety amongst the teachers as to whether the pedagogy being used was applicable (Sections 5.3.6. and 5.3.7.).

6.1.6 Areas of disagreement

In the Literature Review Becta (2004) and Ofsted (2004)(Section 2.4) it was reported that teachers were becoming more discerning regarding their use of programs. What appears to be happening based on the data for this research is that teachers are becoming over-loaded with different programs (Quantitative Data. Section 4.1.2. Qualitative Data. Section 5.3.3). Teachers felt they needed time to look and understand and navigate the programs - something they did not feel they had. They therefore reverted to what they knew – Microsoft programs. These they understood, knew how to manipulate and pupils were also familiar with them (Section 2.4. and 4.1.2.). They tended to only use other commercial programs when:

- 1) Microsoft programs did not cover that area i.e. drawing and art
- 2) The commercial programs were easy to manipulate and understand
- 3) The cost of the commercial programs and their licenses was affordable
- 4) The programs would be regularly used.

This is in stark contrast to the interpretation of the Becta (2004) and Ofsted (2004) findings. It shows that teachers are aware of the limited budgets that schools have. They are also concerned as to how quickly and easily they can navigate a program.

Two teachers interviewed (Section 5.3.1. and 5.3.7) felt that older teachers were reluctant to change their working practice or were not familiar with the principles of using ICT during their teaching. This was not supported by the questionnaire results (Quantitative Data. Section 4.1.1), semi-structured interviews (Qualitative Data. Section 5.3.7) or in the Literature Review (Section 2.4). The exact opposite seems to be the case, where more 'older' teachers are using computers in their teaching than any other age group.

The training for IWBs does seem to vary from school to school in both authorities (Qualitative Data. Sections 5.3.4 and 5.3.6). Once again it appears to be the headteachers who decide which members of staff attend the training, due to budgetary constraints. This is in contrast with the two LA officers involved in this research who thought that their separate authorities were 'rolling out' the training for all staff, through their own consultants (Qualitative Data. Section 5.4.3). It would appear that there is a difference between what the LAs within this research piece think should be happening and what teachers say is happening. All staff should be getting IWB training to enable their teaching to be more effective by using the new expensive technology and also to allow them to experiment with the required pedagogy.

6.1.7 Research aims

The first aim was to investigate the impact of ICT on teachers' in Design and Technology at KS 2. It would appear that the NOF training had very little impact upon teachers' pedagogy. The training was regarded by the majority of the literature and teachers involved in this piece of research as not fulfilling their needs (Sections 2.8. and 4.1.4.). Teachers in the two education authorities used in this research are still uncertain as to what is the 'right' pedagogy to use with ICT and are looking towards their LAs and central government bodies to give some indication and direction (Section 5.3.6.). Teachers are using ICT in Design and Technology lessons. They are using a variety of different applications from information finding to improving finished products (Section 5.3.1.and 5.3.7.). While these different applications are being used in Design and Technology it does not appear to have impacted greatly upon teacher pedagogy. This could be because Design and Technology has always been a creative subject, which Hope (2006: 11) says has the capacity to "foster creativity and innovation" which also tends to be an individual's interpretation of the design brief. Pupils have to work on their own, with teacher support and guidance, so teaching Design and Technology, like other creative subjects, has had to be taught with a different pedagogy from more 'formal' subjects. Pupils have had to investigate, find information, use high-level thinking to problem solve, be able to transfer skills and knowledge, work independently as well as in groups and to fulfil the design brief (Sections 2.2., 2.3., 2.4. and 2.5). Pupils have had to modify their ideas and designs in light of further information and teacher suggestion; thereby using high level thinking with the relevant information, processing it and assessing the situation before making a decision. It would appear that teachers have not recognised this; and yet this is the type of pedagogy that researchers are recommending for use with ICT (Section 2.4 and 2.6).

What computers do appear to have influenced is the planning, researching, drawing and the final recording. Teachers are stimulating pupils to do as Smeets and Mooij (2001) (Section 2.5) suggest - becoming active learners by gathering, summarising and discussing information they have collected. Computers access a great deal more information, feed back that information in a variety of different media, which then allows the pupils to record it in a more attractive format (Sections 2.6. and 2.7.).

The change in pedagogy may not only be the acceptance of new technology in assisting the teaching and learning but also to widening of the knowledge base, transferring skills and knowledge, opening up further discussion, engaging pupils, giving a high level of finished product for the pupil and removing some of the mundane tasks that pupils had to do to complete their design brief (Sections 2.6. and 2.7.).

It would appear that teachers perceived that pupils were more enthusiastic about their work when using ICT; this is based on the qualitative data analysis of the questionnaire data (Section 5.1.1). From the overwhelming number (94%. Table 35) of teachers who returned their questionnaire form, teachers felt (75%. Table 38) that being able to raise the standard of the finished product and having access to information (60%. Table 38) also raised pupil enthusiasm. Table 41 showed that 78% of teachers from the questionnaire felt that ICT brought about a general pupil improvement. Only 28% (Table 42) felt that behaviour was improved, while 65% (Table 42) felt it was engagement that was the biggest area of pupil improvement. These findings are in line with the reports from the Literature Review findings (Section 2.3). It would appear that ICT does have a positive relationship with pupil attitude and behaviour.

Number two and three Research Aims were to investigate issues affecting the use of ICT within the teaching of Design and Technology at KS 2. It would appear that there

are a number of issues affecting the outcomes. Firstly, time to become familiar with ICT and the related programs. Associated with this was teacher confidence to use ICT in the classroom. Teachers are becoming more confident in using ICT but this appears to be mainly for their own out of classroom work. It appears that the introduction of IWBs has boosted teacher confidence at using ICT in the classroom, whilst also allowing the teaching to become more interactive for pupils. The use of IWBs within Design and Technology has gradually been implemented but not fully. This could be due to the fact that IWBs are relatively new and teachers still need time to see the potential and build confidence in their use.

The leadership of the school needs to have a clear vision of their goals and how ICT will be used in teaching and learning. This will then enable the staff to develop their own teaching style within the school's ICT vision.

6.2 Recommendations

6.2.1 Accountability

My research evidence would suggest that the biggest attendances at INSET courses are for the core subjects of the National Curriculum. Headteachers are very aware of their public and professional image regarding the teaching and learning going on in their school. This is all due to the published National Curriculum Tests results, inspections and League table results (Sections 5.3.2., 5.4.2., 5.4.3. and 5.5.2.). These appear to be unhelpful in bringing a broad and balanced curriculum.

Accountability should still be maintained as this is essential to raising standards and improving what goes on in our schools, but a different emphasis should be placed on how inspections are carried out and who does those inspections. If inspections were carried out by a joint team of HMI inspectors and LA officers with a focus on different areas of the curriculum; this could help promote a more broad and balanced curriculum.

6.2.2 LA Funding

The LAs, it would appear, are being slowly stripped of their power and influence (Sections 2.1. and 6.1.2.). The local LA is in the best position to know what local needs and requirements are. This requires the LA to have more of the funding than at present for CPD and INSET courses so that training can be across the whole of the curriculum. The restoration of subject specific LA inspectors who have the knowledge, understanding and passion of their subject area can only be to the advantage of teachers (Section 5.4.3.).

6.2.3 Broad and Balanced Curriculum

The evidence from the two LA Inspectors would suggest that at times there is not a broad and balanced curriculum being delivered in schools (Sections 5.6.3/4/5). A decrease in the emphasis of the core subjects of the National Curriculum and more LA input for INSET could assist in the re-establishment of a 'broad and balanced' curriculum. The reintroduction of subject inspectors would also promote their subject area within the LA, as well as at both regional and national level. Subject inspectors and their associated subject organisations could lobby, promote and influence on a variety of political levels. The information from both the teachers and the LA officers suggests that this is not the case at the moment owing to the

emphasis on the core subjects (Sections 5.4.3. and 6.1.2.). Pupils need a broad and balanced curriculum. They do not all have the same skills and abilities but there must be an area where a pupil can excel (Section 6.1.2.). Without a broad and balanced curriculum children who are not academically inclined but are more artisan or vocational in their talents will always feel a failure because they have not had the opportunity to excel in an area for which they have a talent. A broad and balanced curriculum will not be achieved until the over emphasis on the core subjects is removed (Section 5.6.4.).

Teachers need to have INSET which reflects the needs of the pupils for a broad and balanced curriculum, similar to that now being offered in Authority A (Section 6.1.2.).

6.2.4 Innovative Curriculum

If the central government is serious about raising standards in education and not just about statistics for SATs and League tables, then it should consider and reflect upon the innovative approach used by Authority B in the Focus Interview (Section 5.4.3). In this approach the planning of Design and Technology, with the use of ICT, was managed throughout both school phases. With this perspective, both primary and secondary teachers planned work together. The resulting outcome was that the high schools had to re-think their schemes of work in Design and Technology and ICT due to the higher base knowledge and understanding that the primary pupils brought with them when they joined the high school (Section 5.4.3.). This certainly appears to have raised standards. Indeed the inspector from Authority A was keen to also implement this approach within his authority but again it was the cost that inhibited its implementation (Section 5.4.3.). If the government is serious about raising standards then there is no reason why this type of approach cannot be piloted in other subject areas.

The resulting understanding of the pedagogy used in all phases of the education system was also a plus. This would strengthen the idea of using high school staff for INSET training within all schools, as greater awareness of the different pedagogical styles would be present.

6.2.5 Training

Networking is an alternative method of training and up-dating of current skills and knowledge (Section 5.4.3.). What this does mean is teachers having to give of their time, something they are finding increasingly difficult to do (Sections 5.3.3. and 5.5.3.). If schools were to copy what happens in certain industries and have early morning training sessions combined with a later opening, then this would assist in keeping teachers abreast of innovations in teaching. This could be done on a pyramid basis to enable quality assurance.

Teachers are always going to need up-dating with the world of ICT as changes and developments are happening at a rapid pace. Some teachers still are not aware of the abilities of some of the Microsoft programs (Section 6.2.5.). If something similar to the European Computer Driving License (ECDL) was initiated for all teachers and learning Support Staff, then central government would be aware of the standard of ICT for its primary work force. This would enable staff to really understand the potential of the programs and assist in helping to navigate other commercial programs. This could increase the skills capabilities of the whole work force.

With the advent of SLICT training, senior staff is being introduced to a possible pedagogy for using ICT within school. This will then be cascaded down to staff who should be able to feel they are able to experiment with different teaching styles when using ICT. (Section 5.3.5.).

More CPD pedagogical based training would also ensure that teachers could familiarise themselves with current thinking in this area. The New Standards (DfES 2007a) acknowledges that;

The working environment is changing at an unprecedented rate. Like every other profession, teaching must keep pace if we are to prepare children for a rapidly changing labour market. For teachers, as much as for their pupils, the issue is one of life long learning: the need to continuously build and update skills.

(<http://www.dfes.gov.uk/> Accessed 18/6/2007)

Maybe central government now recognises that teachers do need to be continually trained and kept up to date with all aspects of teaching and learning.

6.2.6. Reflection on Methodology

The methodology was somewhat compromised by the lack of returns for the questionnaire. Cohen *et al* (2000) recommends a minimum of 40%, this research got a 33% return. The return profiles did match the statistical profile for teachers' gender, age and teaching experience for both local and national figures.

While the outcomes of this research cannot be generalised to the teaching force of England, they do show a trend of agreement within the local authorities used for the research. The Semi-Structured Interviews supported the findings from the questionnaire as did the Literature Review. It would appear that there is some validity for the findings of the research.

6.3 In Conclusion

Finally, the researcher has benefited greatly both personally and professionally from researching and writing this thesis. Personally it has been a challenging experience to pursue further study and continue with a busy professional role. It has had positive benefits for his professional role. He has grown intellectually through the researching, reading and writing that has been required.

The researcher has submitted four papers; three to international conferences and one to an annual national conference. All the papers were accepted by all the conferences.

The support and encouragement of fellow colleagues has been most rewarding. The road has been a long and winding one, with many challenges along the way, but nevertheless one he would not have missed as it has been overall very rich and rewarding.

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Lockside
Queensgate
Huddersfield
HD1 3DH

To Whom It May Concern:

This letter is to confirm that I have met with Graham Morley regarding his research within schools and I am more than happy for him to circulate his questionnaire within the authority's primary schools.

I am sure Graham's results will be of interest to our teachers and look forward to reading the conclusions of his study.

Yours sincerely



School Improvement Officer D&T

Permission for research within LAs

Local Authority B

To whom it may concern.

I have met with Graham Morley and I am happy for him to circulate a questionnaire relating to his research in District primary schools.

A handwritten signature in blue ink, consisting of a stylized first letter 'P' followed by a series of loops and a long horizontal stroke extending to the right.

ICT Adviser
Education and Cultural Services

28th. April 2005

Dear Head Teacher,

My name is Graham Morley and I am a senior lecturer at the University of Huddersfield. A part of my doctorate is to investigate an area of education that has not already been researched. I am, therefore, investigating the use of computers, interactive whiteboards and the appropriate software in Key Stage 2 Design and Technology.

Your staff's views are essential to my research and I do appreciate that they are very busy; but I would be most grateful if you would pass on the questionnaire and accompanying letter to your Key Stage 2 Design and Technology Co-ordinator.

Having completed the research, I hope that the findings will contribute to extending our knowledge of ICT, its bearing upon teaching and learning and have a positively influence on our practice.

I have the approval of your Inspectorate to circulate the questionnaire.

All information is strictly confidential and anonymous.

Thanking you in anticipation,

Graham Morley

Contact letters to schools

28th. April 2005

Dear Colleague,

My name is Graham Morley and I am a Senior Lecturer at the University of Huddersfield. I am investigating the use of computers and interactive whiteboards in Key Stage 2 Design and Technology as a part of my doctorate.

A part of my research involves a questionnaire to all schools in XXXX and XXXX L.E.A.s to establish specific data.

Your views and answers are essential to my research and I do appreciate that you are very busy; but I would be most grateful if you could spare a few moments to fill in the questionnaire and return it to me in the stamped and addressed envelope provided.

I have the approval of your Inspectorate to circulate the questionnaire.

All information is strictly confidential and anonymous.

Thanking you in anticipation,

Graham Morley

Contact letters to schools

7th. June 2005

Dear Colleague,

I wrote to you last month asking for your help in gathering data regarding the use of ICT in Key Stage 2 Design and Technology. Your data is most valuable to me as the larger the sample I can gather, the more reliable are my findings.

If you have not returned my questionnaire I would be most grateful if you could complete it as soon as possible (No later than the 24th. June please) and return it in the post paid envelope sent with the questionnaire.

If you have already returned the questionnaire, thank you very much and please disregard this letter.

If, for any reason, you have not received the questionnaire and would be willing to take part in the survey, please do not hesitate to contact me.

Yours sincerely,

Graham Morley

Senior Lecturer
School of Education and Professional Development
University of Huddersfield
Lockside
Queensgate
Huddersfield
HD1 3DH

Tel 01484 478240 (direct line)
e-mail g.morley@hud.ac.uk

Please RING the appropriate answer or answers to each question.

Some questions may require short written answers, please use the lines provided.

Please DO NOT miss any questions.

COMPUTER AND PROGRAM ACCESS

1. Are computers available during D & T lessons? (1) YES / NO (2) 1
2. How many computers are there available for D & T? 2
3. How often are computers used in D & T?
 (1) (2) (3) (4) (5) 3
Every lesson frequently occasionally infrequently never
4. Do you use any of these programs in D and T?
 If YES please ring the one(s) used. Ring **more** than one if you wish.
 (1) (2) (3) (4) (5) (6) (7) 4-10
Word Excel Access Power-point Publisher Outlook Inter. Explorer
5. Do you regularly use **other** programs in D & T lessons? (1) YES / NO (2) 11
6. If so, what are the other programs? (1) 12
 (2) 13
 (3) 14
7. How frequently are any of the programs in Q4 and Q6 used?
 (1) (2) (3) (4) (5) (6) 15
Every lesson Frequently Occasionally Infrequently Very rarely Never
8. Is the internet used in D & T lessons? (1) YES / NO (2) 16
9. If yes, for what? (1) **Specific information**(1) YES / NO (2)
 17
 (Ring **more** than one if you wish). (2) **Ideas**..... (1) YES / NO (2) 18
 (3) **Referencing**..... (1) YES / NO (2) 19
 (4) **Other** (1) YES / NO (2) 20

If 'Other' please state21-22

TEACHING

10. What are computers used for during D & T lessons?
 (Ring **more** than one if you wish). (1) **Word processing**(1) YES / NO (2) 23
 (2) **Drawing/ Designing**(1) YES / NO (2) 24
 (3) **Control** (1) YES / NO (2) 25
 (4) **Spreadsheets**..... (1) YES/ NO (2) 26
 (5) **Data Collection**..... (1) YES/ NO (2) 27
 (6) **Other** (1) YES / NO (2) 28
 If 'Other' please state 29
11. If there is a particular computing skill that is required in a D & T lesson – is this taught before or during the lessons?
 (1) (2) (3)
DURING / BEFORE / BOTH 30
12. What pupil groupings do you regularly use for computer work?
 (Ring **more** than one if you wish.)
 (1) (2) (3) (4)
Individual Pairs Small Group Group 31-34
13. When pupils use the computer, do their findings/outcomes/interests influence the direction of your intended lesson? (1) YES / NO (2) 35

INTERACTIVE WHITEBOARD

14. Is an interactive white board available during D & T? If NO go to Q18 (1) **YES / NO** (2) 36

15. Do you use the interactive white board during D & T? (1) **YES / NO** (2) 37

16. Do pupils use the whiteboard? (1) **YES / NO** (2) 38

17. What is the interactive whiteboard used for? (Ring **more** if you wish.)

- | | | | | | |
|----------------------|---------------------|-----------------------------|--------------------|--------------|-------|
| (1) | (2) | (3) | (4) | (5) | 39-43 |
| demonstration | introduction | ideas/ understanding | information | other | |

If 'Other' please state 44

PUPILS

18. Do pupils appear to be enthusiastic about using computers in D & T? (1) **YES / NO** (2) 45

19. What do you feel, enthuses pupils most when using the computer? Its:

(Ring **more** than one if you wish).

- | | | | | | |
|--------------|-----------------|--------------------|-------------------------|--------------|-------|
| (1) | (2) | (3) | (4) | (5) | 46-50 |
| Speed | Accuracy | Information | Finished product | Other | |

If 'Other' please state 51

20. Are pupils' ICT skills and knowledge easily transferred into DT lessons? (1) **YES / NO** (2) 52

21. Do you feel there has there been any positive improvement in any of the following during D &T lessons as a consequence of using computers? (Ring **more** than one if you wish).

- | | | | | | |
|------------------|-------------------|----------------------|---------------|-------------------|-------|
| (1) | (2) | (3) | (4) | (5) | 53-57 |
| Behaviour | Engagement | Work Standard | Effort | Attainment | |

22. Do you feel that computers have contributed to raising pupil achievements? (1) **YES / NO** (2) 58

23. If yes, how do you feel computers have helped to raise pupil achievements?

..... 59

NATIONAL CURRICULUM

24. From the programs that you use, which programs help you meet the schemes of work requirements? (1) 60

(2) 61

(3) 62

(4) 63

(5) 64

(6) 65

25. How do these programs assist you in meeting the NC schemes of work?

..... 66-68

.....

TEACHERS

26. Please indicate your gender. (1) **MALE/FEMALE** (2) 69

27. Please indicate which age band you fit.
(1) (2) (3) (4) (5) 70
20-30 31-40 41-50 51-60 61+

28. Please indicate your approximate years of teaching experience.
(1) (2) (3) (4) 71
0-10 11-20 21-30 31-40+

29. Have you taken part in New Opportunities Funding training? (1) **YES/ NO** (2) 72

30. Has the NOF training assisted **your** use of computers in school? (1) **YES/ NO** (2) 73

31. If yes, please state how: (Ring **more** than one if you wish).
(1) (2) (3) (4) (5) 74-78
confidence deeper knowledge want to know more more skilful Other

If 'other' please state 79
.....
.....

32. If you wish to make any further comment please do so 80-84
.....
.....
.....
.....
.....

Thank you for taking the time to fill in the questionnaire.
All replies are anonymous and strictly confidential.
Please return the questionnaire in the stamped, addressed envelope.

Opening and closing statement for all Semi-structured and Focus interviews

Introduction to Interview

Thank you for giving your time to be interviewed.

All answers are confidential and not available to any third part.

Do you mind if I use a Dictaphone to record your answers? The tape will be wiped clean when transcribed. It is so that I can concentrate on your answers.

Close of Interview

Thank you for your time and assistance. Your information is most valuable to me; it will not be disclosed to any third party.

Thank you.

Sample of questions for semi-structured interview

Main Questions for Semi-structured Interviews

1. Teacher awareness of ICT

What do you feel are the benefits from using ICT, both personally and for pupils?

- **In what ways have you seen teachers change their teaching when using ICT in the classroom?**
- **How does pupil learning benefit when using ICT?**
- **Do teachers find ICT aids their work load; if so in what ways?**

2. Teacher awareness of the benefits of using ICT

An over whelming number of respondents gave no response to the question regarding the use of ICT in assisting with the National Curriculum; why do you think that was?

- **Do you feel that teachers are aware of how ICT fits into the NC S of W?**
- **In what ways could teachers be preparing lessons using ICT?**

3. Programs

From the questionnaire it appears that teachers use the majority of MS programs much more than other commercial programs in D & T, why do you think that is?

- **Why do you think teachers are not using Access? Data Handling – RM 1st Workshop**
- **What is it about other commercial programs that teachers like/ dislike; can you give examples?**

4. IAWB

Do you have Inter-active White Boards in school? What support/training is being given to you regarding the use of Inter-Active White Boards and their use in the classroom?

- **Teachers appear confident when using IAWB; why do you think this is?**
- **How do you think IAWB aid teaching and learning?**

5. Training

How could further training help teachers' with ICT?

- **Is there any other type of assistance that could be given to teachers to help with ICT skills?**
- **Should there be specific training if so in what areas i.e. pedagogy, trouble shooting, etc?**
- **Would you be happy with in-house training or should it be from outside; why?**

6. The Future

What future vision do you see for ICT in schools, and in what ways is your school prepared for that vision?

- **How do you see the management of the school assisting in moving the school forward with ICT?**
- **When looking at the wider picture, what needs to be done in-house, locally and nationally?**

Interview No 1

14 June 2006

Male

Age 41 – 50

Teaching experience 11 – 20 years

I = interviewer

R = respondent

I: My first question is to do with teachers and their awareness of ICT. Do you feel that there are benefits from using ICT, both personally and for pupils?

R: Yes certainly, it's, I mean I've been teaching around 12 years now and erm the biggest, I think, benefit from ICT which, to be truthful, can be more painful to use than not if you've got one computer in the classroom and 30 children, then it's always a struggle getting anything of value out of it and it becomes more of a hindrance. Certainly with our school, the two major benefits we've seen, and we're quite a small school, 190 pupils with 7 classes and 3 of those are mixed years. The benefits we've seen from the interactive whiteboards which bring ICT to the whole of the children, to the whole of the class and it's, it's inclusive by its very nature because it's there and the children can come and use the technology so that, you know, that they're interacting with the ICT and erm when we were trying to look at numbers, the baseline we were trying to get was 1 to 8. We have no space in such a small school to put the computers once we had so many in classrooms and on corridors that there were no further places to put them and there were huge problems with the authority wanting to give us notebooks and laptops which, er, as a teaching staff we didn't feel we could cope with. So the Head and the Governors made erm a decision that they would use some direct funding and they would claw forward some money and we have got an ICT suite on to the school. So now the children have got the ability to go in the ICT suite and erm use equipment one between two and an interactive whiteboard and the ICT through there, either through teaching pure ICT or teaching other subjects but with an ICT slant. We're going for numeracy, we're going for literacy and the children are timetabled for definite ICT input. So that the major influences that I've seen, the ICT suite for the children being hands on, but certainly for my time and for using ICT as a tool, it's been the interactive whiteboards.

I: Do you use the interactive whiteboard when teaching Design Technology?

R: Erm, yes in as much as we do the research stage, so when we're using Design Technology and we're thinking about, for example, one of the things I did with Year 6 last year, erm one of the QCA units is "shelters", erm so its fairly quick now with a broadband connection to download lots and lots of images of different types of shelters, and I found a fairly bizarre website in America where they make adult tree houses, tree houses for people in their huge Californian back gardens. I think it's a throw back to their childhood. They have like; it's like "Swiss Family Robinson" three tier tree houses with a rope swing and erm a walkway to the next one. So the children were absolutely fascinated with that, but that was a strange thing because in their designs they wanted two tier, three tier houses and shelters to go with what we had made, so erm it comes in in the design stage, not really in any other stage.

I: So it greatly influenced their thinking then?

R: I think so yer.

I: My second question, teachers' awareness of the benefits of using ICT. An overwhelming number of the respondents gave no response to questions regarding the use of ICT in assisting with the National Curriculum. Why do you think that would be?

R: Em, I'm not sure. I think that certainly we've been fortunate that we've had a Head that's been quite keen on ICT. Not so much that it's forced on us, but he's taken my advice, erm as ICT Co-ordinator, and advice from erm the authority, from erm ICT teachers in the authority, and I think we've got the best. We've made one or two bad decisions with pieces of equipment, but generally, erm, the Head's been proactive in, erm, buying things that would work for ICT such as the interactive whiteboards, and we've made sure then that we've bought software that would support the National Curriculum. Now I think if, erm, members of staff have had these things forced upon them and they're not keen because, of course like any school we'd have all levels of ICT and awareness of ICT and abilities to use ICT. Erm, then people may have not feel, felt, that they were supporting the National Curriculum and it might have been through the training and the, erm, types of equipment that had been bought for them.

I: Do you think it could be that teachers are not aware of how ICT fits into, especially in DT and the National Curriculum programmes of study?

R: Erm, yer, and I think some things are you know naturally lend themselves to the interactive whiteboard and so ICT which is what we tend to use if for. Erm, so certainly with the interactive whiteboards I would tend to use it for research and, for example, yesterday the children in Year 3, er they are doing one of QCA units on moving monsters, the pneumatics unit. So they were doing their research part in the ICT suite. So they were searching the internet for images monsters, erm so that they could think of some type of monster and then move on to how to fit the pneumatics into the type of creature they wanted. Erm, I'm not aware of any software packages that have been pushed, and normally I get recommendations through the authority and through various websites, professional websites that I use, of packages that people have said that, you know, this is really good for ICT. So I think until, you know, there are some packages that, I don't know, make it come to life for me, then it's probably not something I'd use ICT for. I wouldn't link the two together.

I: Is that a cost thing do you think, or a waste of your time looking at these things if they don't come recommended?

R: In as much as I haven't found something, yer. Because you've just got so, as a primary school teacher, you've just got a million and one other things to do, you know, it's erm, it just such a time consuming job, even with erm your 10% PPA time you spend that marking, you spend erm that preparing for your next lesson. You don't spend it looking for other things, and certainly as being a small school, we've got you know two or three things, curriculum areas to look after. So I've got ICT and DT, but until someone actually says to me, oh this is a fantastic piece of software for DT, erm, er it's not something that I would go for and, as you said, I think it would be time.

I: Do teachers use ICT in their planning then, do they plan using ICT?

R: Yer, something that we've, er, one of the things that we've, er moved towards is we do all our planning in a Word format. Erm, and then year on year we tend to just change slightly

what we've done. Erm, and now we're going on to a, have to go on to a two yearly cycle because we've had a drop in the cohort, erm that planning will sort of roll over, erm and what we've been asked, what I've asked the staff to do in a recent staff meeting is, I've showed them how to do hyperlinks, erm so that if they found we have erm a cache server, do you know what a cache server is? So I've got a cache server from a company called "Espresso" who erm through the broadband connection at midnight we get a new download on a Thursday of video-based software and then activities to do with that. Erm, so what I've asked the teachers to do is when they are using something in Espresso if they've found it and they liked it, to add it into the planning, showed them how to do it as a hyperlink, erm and if they're setting something, up for the children, say it may be a worksheet in the ICT suite, I've showed them how to do a hyperlink on the children's worksheet so that the children link to it from. Which saves all the hassle. You know the website won't come up so I'm not quite sure what they have done, they've put a space in or a comma or not spelt it properly. Erm, so we are moving towards more including ICT in our planning. In as much as that.

I: My third question is about programs. From the questionnaire, it appears that teachers, or the majority of teachers, use Microsoft programs much more than any other commercial programs in design technology. Could you suggest any reasons why?

R: Erm, well there was this talk of being and industry standard. Certainly from my point of view lots of teachers outside our school, erm, or the authority ICT teachers try to push a program called "Text Ease", now I've found that quite hard to use. Personally as an adult, I think that the Microsoft things are so powerful and they come bundled with the machines anyway, that it seems, you know, a strange decision to want to buy something else when you've got a set of office programs there.

I: The only thing nobody used was Access and the only data handling program that people mentioned was erm RM First Workshop.

R: Right.

I: Which seems strange that every response didn't use Access.

R: I think certainly for us as a staff, erm, we had, there was erm, a very poorly conceived idea from the government about staff being trained, erm towards computers a couple of years ago.

I: I was involved in that.

R: NOF?

I: Yeh, that's right NOFTI training.

R: Oh, it was so cumbersome and bizarre. Teachers were obviously all at different levels, erm, and they had to assess their own needs and do their own training basically and I, I thought it was so, what I asked my staff to do, I bought the collate materials from, er, tertiary education from erm Wakefield College and we all sat and did a collate course. So now as a staff our levels of ICT are raised but again we were using the Microsoft commercial programs. So certainly I think that that would be the staff are comfortable with Excel because they use it for assessment, they use it for recording, because we were trained in it, because we were

trying to build our own knowledge up. They were comfortable with Word and PowerPoint, because they are useful for the interactive whiteboard for creating work sheets and planning.

I: and Publisher?

R: Erm, we use Publisher because, you know, it creates nice backdrops and web pages which is again something that we have to do curriculum-wise with the children. But Access, that's the database?

I: That's the database.

R: I've certainly never used it and I use ICT a lot. Erm, so I can see that it's, it's a program that people wouldn't really use, I'm not sure why and certainly the starting programs for erm, from RM are very good. We tend to use Starting Graph as well as, erm the one you just mentioned. Erm, and they are a good start for the children, they're easy for the children to understand as well.

I: You've more or less answered question 4, which was about interactive whiteboards. Erm, what support training has been given to you regarding use of interactive whiteboards and their use in the classroom?

R: We have, erm, a network of , erm, teachers, erm, leading ICT teachers, erm, and you can come together with your, we work in a pyramid system.

I: Yep, yep.

R: So that the, the teachers from all our pyramid meet, erm, bi-monthly, every two months, is that bi-monthly?

I: Yer, yer (laughter) I think so.

R: Or is that twice every month? I wasn't quite sure. They meet every couple of months, erm, just to go through either new things that have come on, on line, such as the Smart software that we use, whether there's been an update, erm, its purely voluntary, erm, and certainly what we did in our should, we, we bought one of the leading teachers in for three staff meetings. Erm, he took one of the sessions with the teachers that felt that their skills were weaker.

I: Yer.

R: So he started right at the bottom and I took another group of teachers who felt confident with their ICT skills and we moved on at a greater pace through.

I: Are there any authority initiatives to make sure that people are able to keep up to date, people like yourself who are obviously ICT literate, erm do they train you to cascade that down into school?

R: Erm, yes I have, erm, an ICT co-ordinators' meeting, erm, four times a year, erm, and they bring you know new softwares, new ideas, er, out to people there. Erm, and those sessions are

free. Any interactive whiteboard sessions you have to pay for, so it's, you know, at the Head's bequest that you can go onto that.

I: Yeh, right.

R: Certainly with our own school, erm, it's, it's, it's a very nice staff and, erm, unlike other schools I've worked in, where people wouldn't talk about new things that they had found on the whiteboards, things like this, it's very much that we swap ideas and compare things we've found in this school.

I: A lot of collaborative learning.

R: Yer.

I: Great. Training then now. How could further training help teachers with ICT? What sort of training do you think they would need? Again, I think you've answered most of that in the way that you work within your school.

R: Yer, certainly I do think that what at the moment our school is tied in with a national initiative with ICT and learning, erm, and what I've had to do is I've had to take an audit of the use of ICT throughout school and we found that the spare computers that we've got, erm, dotted around school in corridors and the odd one in classrooms not being used, erm, we use a program called "RM Maths", which is an individual learning program and it takes children from reception level through to level 5* in erm, Maths. And, erm, the teachers have tended to use it for that. But then the screen stays on and you see the screen saver and it's not used. But the interactive whiteboards, according to my survey, were used for every lesson. Even if they were just used purely as an electronic whiteboard if you will, but more and more people were using them to have pictures as a stimulus for, erm, literacy, they were, erm, people are scanning in the text that we're doing within literacy and referring back to them and keeping an open notebook so that they've got spelling on one page, they've got text on the next, they've got a grammar lesson on the next and then they've got a teacher led writing lesson. So that on the final day when they bring the whole unit together, they refer back to all the things that they've done so that they can keep. Now that was always obviously something that would be no good to do if you had, erm, a blackboard or a whiteboard. Flip chart possibly because you could keep flipping over but people have tended to use it for that. We've got marvellous set of Maths programs made by, erm, a local teacher called "Primary Games" and we've got a whole gambit of them and people absolutely love them, they are so colourful and the children get so much out of those. People tend to use them every Maths lesson. The Science software that we've got, erm, that tends to be very good. We've got some virtual experiments, erm, so you can do the experiment on the board, the children can change the variables, they can see the experiment taking place. You don't have to wait for your beans to grow, they grow virtually. Erm, you don't blow any battery bulbs, it virtually blows on the screen, so you can tell them "oh dear, we've done that". And then, you know, when they actually get the equipment out, you tend to find that they know much more what they're doing and they're much more careful with the equipment as they get it out cos they've seen what can happen on the board. Erm, but from that audit I had to take where wasn't it being used and er obviously DT wasn't being used. It wasn't being used in the obvious ones, PE, erm I can't see how you would do that. There was a hole in RE as well. Erm, so from that the funding is left for four days for me to be off timetable to try and er, either aid teachers where they think they could use it, or to look out some software to try and fill that. Now in some points we've done that,

we've got some software to support RE with images and erm, some quizzes and some other things, erm, but with the four days I'm going to use it for building images for DT. Erm, people were wanting some more things for literacy, erm, even for me just to be sort of scanning in text so its there as a bank of things to refer to later on. So we are involved in that initiative at the moment where, erm, I've done the audit and then we're going to try involve our ICT more. Erm, its also, erm, from that we've found that we use the suite a great deal as well. That's timetabled and everyone fills their time table slots. What people don't find useful, are the odd computers on the corridors. They prefer to teach ICT as a subject, or to teach it in a subtle way through doing their literacy. Erm, but the children have got the ICT skills now to be able to do this.

I: My final question, erm about the future. What future vision have you got for ICT in school? I mean, in what ways has your school prepared for that?

R: Er, well certainly I know authority-wide and nationally there's going to be a large headache in the next couple of years with replacements of machines, erm, because we were given, erm, you know a huge tranche of money through the National Grid for Learning and those machines are now coming to the end of their life. They're creaking away and having to replace. Erm, I've tried to, erm, cobble machines together when a CD drive's gone down, taking a RAM chip out of one and CD drive out of the other and tried to make the best. But they really can't keep up with, erm, the brand new machines that we've got in the suite, you know, the XP machines. The Windows 98 machines we've got 14 of them that will all need replacing within the next year, er, so I know financially there's going to be a headache nationally and locally for that because the funding isn't there, a new lump of money is not going to come from government, so it's all going to be from your own budget. So that's certainly something that we've got to incorporate now in our school budget. We've got to have a rolling program of replacements of machines. Certainly the future for ICT in our school, erm, its strange because three years ago people didn't want a laptop. I had three members of staff that didn't want one, but if machines go down now, we had a burglary just before Christmas, erm, and a laptop went and a socket was ripped out for the interactive whiteboard and it took seven weeks to fix. Well it was like the teacher's right arm had been cut off. She really struggled with preparing lessons and getting lessons ready and that's strange because she was one of the people that I was trying to force a laptop on three years ago (laughter from both). She's on her third already (laughter from both). So certainly I can see that ICT for staff members for preparation, for planning is invaluable, erm, because it saves time. And as long as its a tool that's useful for saving teachers' time, then I think it will be, you know, something that we will always want within St Peter's. Erm, certainly I think that the interactive whiteboards have been a revelation. Before now I've been stuck with a cardboard clock that I've made with numbers on, trying to stick things on a whiteboard and the plastercine, blu-tac, not quite working, everything falling to floor and me trying to cover it up, and it's all instantaneous, it's all there now, it's working, it's a fairly robust broadband system that we've got with the cache server so things work, erm.

I: If money's no object, and you know, how would you see the future of ICT within school?

R: Erm, I don't see it as children all having laptops on their desks. I think that would take too much away from the basic skills. I think that they get sufficient moving into a suite. It would be fantastic for every child to have a computer in the suite rather than share one. But I'm a realist and I know how much it costs to put a very small extension on a school made out of

breezeblocks. Erm, so a suite would be absolutely fantastic with each child having a computer to themselves. Erm, but certainly I don't see children sat at laptops. There has been a great deal made in our authority of a virtual learning environment where children would access this from home. I have concern there about which parents could either afford that, or, erm, the parents that don't bother to hear their children read and don't bother to take them to museums, would they bother to use the virtual learning environment either? So I'm not sure about that idea yet, it's certainly one that's been pressed authority-wide onto us. But some things in education don't work well if they're rushed at. So, I would like to see how that went. But certainly I think that the more types of systems like the interactive whiteboard that we can utilise in school the better. I mean that came from business didn't it?

I: Yes.

R: I think it's been a marvellous thing.

I: OK, well thank you very much for taking part. Any questions you'd like to ask me?

R: No if you're happy.

End

Focus Interview

1. How can teachers be best supported with developments and issues for ICT?

Issues:

- **No time for anything/general over-load**
- **The use of advisory teachers/Co-coordinator's role**
- **Use of networking/cascading**
- **Lack of training/ pedagogy**

2. What needs to be done to ensure teachers are aware of the variety of both hard and software available to them?

Issues:

- **Limited time to 'play'**
- **The lack and variability of training**
- **Raise awareness of developments in ICT**

3. What do you see as the future of ICT especially in D and T?

Issues:

- **Awareness of the possibilities of future hard and software**
- **How ICT can assist teachers**

GM: I have just three questions to ask you. The first is: How can teachers be best supported for developments and issues for ICT? One of the things that has come up time and time again, both in the interviews and questionnaires, is the lack of time for teachers, both in keeping up with the technology and being able to use the technology. I just wondered if your authorities have any views on that and how to lessen the load.

MC: Mm, predominately in terms of the input of what our primary teachers get, the great issue is finance and releasing teachers to attend courses, that's what we have found in Kirklees, when we actually advertise a number of courses were work in conjunction with the ICT team and D&T trying to put on courses in conjunction, we still don't get the attendance and that's basically because the schools can't afford to release teachers to attend the courses and various other things. So a lot of the kind of input that we do tends to be done through free sessions really through, we run termly primary D & T net works, the last primary net work we did a control sessions we looked at 'Flow all' and basic concepts of control.

GM: So are the sessions structured in such away that you are anticipating that it will cascaded back into the schools so coordinators will come and they will show

MC: Its courses is open to, it's aimed at coordinators of D & T, but it is open to all teachers KS1, 2 and early years, but the hard thing we have is trying to pitching it to all those teachers so basically what we found was that teachers would come and talk a lot you know obviously in terms of 'Flow all' which obviously was not appropriate for kind of foundation teachers and various other teachers. But what we try and do is, I mean when we put a flier out, I mean, the 'Flow All' came as a response to teachers anyway, with the last session we had at the primary network was to do with mechanisms and the last five minutes is always discussion in terms of what they would like in the next session to be and from that came the input on control and that was work in conjunction with ITCAS it is the ICT team in Kirklees so myself and an ICT consultant did the input for teachers, they are very much the resources that we give them they then give, they then, I know a lot of the primary schools I work in have staff sessions after school where a teacher would actually, teachers are expected to share the course they have been on because, I think, purely because it's such a rarity for teachers to get out on to go out on a course that is not literacy, numeracy based, that when they do, then it is something they will cascade down in school down in school in terms of sharing resources and handout any information that might be relevant to the various years within school, I'd say that is the most, we do, some courses do run, but predominately that's where we get the most, we get something like twenty to thirty teachers sometimes to the network.

GM: There does seem to be a lot of discrepancy between schools in who is allowed to go on courses and the amount of money. One of the things that came up was the interactive white boards, some schools seem to have interactive white boards in every classroom, some seem to have a couple, some everybody is allowed to go for training, others it has to be cascaded down from the coordinator, there seems to be no pattern to the training.

MC: Yer, I'm not sure when I was in Wakefield, I know in Kirklees we have specific consultants linked to interactive whiteboard training and I'm sure there is some funding within the authority specific that has been specifically rolling out in the past two years for that, so that is not so much an issue and a lot of that is done actually bespoke in schools and goes into school.

GM: I also thought when people like Smart and Promethean installed; they also gave some training as well. During my interviews two of the staff denied that there was any training.

MC: In Kirklees we have all gone down the Smart board route and I think the authority has buy them because they have got a deal as an authority, so basically I am sure that part of that deal was so that they would not be expected to give the training out so I am not sure if they actually got training apart. I think the training came through the authority, the boards came into the schools and training was given by the authority. Em, Yer I am not sure they did receive training from the actual company; I think it would be the consultant within the authority who would provide that. Still, I mean still, still a lot of the, I originally did a consultancy in a school and the major consultancies I do tend to be based around OfSTED. So OfSTED go in they inspect, and they you know they fail an issue, with ICT in D & T and the last consultancy I did was specifically that. I went into the school as part of a training day and several training days a year and so one of the training days was put aside for D & T and particularly ICT and looking at embedding ICT into D & T projects, so you tend what the consultant I will do is relating to D & T and ICT as specifically that, it's linking some issue that has been highlighted through OfSTED so obviously then it's the schools development plan so it's something they have got to act upon before the next OfSTED and be seen to act on so that's where the specific training comes in.

GM: Pedagogy seems to be quite an area that teachers are concerned with as well with regards to training for ICT in general terms they are not sure they are using the ICT properly. They seem very very afraid at times to want to use ICT because they are worried that OfSTED will come in or somebody in authority will come in and tell them that they are not using it properly instead of going along with it.

MC: But I think ICT and D & T are very similar in term that they have the potential of going 'pear shaped' hasn't it and that's why and I know for a fact that, I mean when I looked through the old framework when they used to inspect the specific subjects they obviously don't do that so you don't find that, the old inspection framework, em something like 80% of inspections said they did not have enough information to comment upon D & T because they didn't see it being taught, and I know for a fact that there is lots of D & T going on in there but I think teachers steered away from doing a D & T lesson when OfSTED were in because that tends to go 'pear shaped' when and I'm sure it's the same in ICT really you know you get a group of kids around an ICT suite and get the whiteboard up and you can guarantee if you've got someone observing a lesson it is going to go 'pear shaped' and you know so they avoid that risk I think. So I think there's a great, em a bit to that you know. It's not an area where teacher are particularly confident you know.

GM: No, this is what both HMI and OfSTED have all reported that they have a lack of confidence in using ICT and doing D & T as well in the reports especially when they have specific to the subject as well the reports.

MC: It's all something you've got to get your head around as well when you think of the valid number of pieces of software you can actually use in D & T and the ICT have less and less time to get their heads around the software to feel confident, confident enough to sit in front of a class of year 5 year 6 kids and take them through it.

GM: I think OfSTED and HMI often do get a bad picture or not the correct picture because in two reports they have said that teachers are being, the phrase was 'are now being more discerning about programs that they use' and yet all the information I've got back, both through questionnaire and interview has been the fact that teachers use Microsoft because of two reasons: First of all it's there and secondly they understand how to use it because they use it every day. And it's not they, the only time they seem to want to use other programs is when want things like art programs and Microsoft don't do them so then they will start to use them, oh and the other one was Access because it's not used friendly as such and you have to sit down and play with it to get to understand how it works, but other wise they are just using Microsoft programs and yet there is all these programs flooding in, and again it seems to come back to time as well.

MC: It is, if you look at it in terms of secondary context, I mean, if you're teaching control in D & T in a secondary context and you teach it a number of times through the year with the same classes, if you are a year 5 or 6 teacher it might be just like a two week slot that you teach it and you are not going to use it again until the following year and in that time you've forgotten unless you use of piece of PC software on a daily or weekly basis you're not going to know the ins and outs of it and your not going to be able to remember that, so that hinders it in some ways, which the nature in which that primary's teach their projects which means when it does come a year later around just thinking 'Oh god how do I use that and what did I use again?'

GM: What's an input, what's an output?

MC: Yer, that does tend to put them off, yer in lots of ways. But it's a case with, I mean you look at a lot of them, primary lessons that I observe that, not just D & T, look at the use of the whiteboard and it is predominantly you know, 'Word' based, and or used for graphs or charts and things like that.

GM: and a few power points

MC: that's it, they're just scratching the surface in terms of the potential of the whiteboard, you know and I keep trying to push them into trying to used more interactive, you know, software on there, you know they're not really hold that potential of the whiteboard anyway.

GM: One thing during the interviews Keith was the way that Wakefield seem to have a very close relationship with teachers do for ICT looking at programs, ICT coordinators seem to meeting quite regularly to review software and any hardware that's come on the market.

KW: I think to some extent we are in a similar position to Kirklees, we have a big issue around funding and what schools choose to spend their funding on and also the knock-on-effect that that is around attendance and getting people out of schools and we have got a good network of ICT coordinators and that is down to the fact, I think, that we've a

good specialist team with an ICT advisor with a team of consultants who work both across the strategy but also direct with coordinators with network meetings. The issue with us, I think around D & T is that we do not have subject advisors and there for subject networks for things like D & T we tend to broker and buy in through networks else where like for example CFBT. But I think the, in terms of the way we do try and provide support for D & T coordinators are things like the VLE's we have for each curriculum area, we have a range of AST's and the AST's go out and work with either groups or individual coordinators including D & T and we also have active links with the Primary Learning Networks and again we use those as drivers for either subjects for example D & T or we use them for drivers for ICT. So I think we have a different model within Wakefield in the sense that we have a core a small core of ICT advisor consultants. We also have to build capacity links through strategy and also IST's, but the bottom line is, we find that schools have got the funding; they prioritize around who goes what access to training they have. We do talk to them about links, in terms of links to ICT, cross-curricular approaches, to teaching and learning, use of interactive whiteboards and again, you know there is a high level of awareness and expertise within schools but the networks are crucial for us for us of tapping in to resources we have got in schools, because we do not have the capacity, as we used to as a local authority to actually lead and pull networks in a way as we used to, to get to ...

MC: What role do the specialist colleges play in Wakefield in terms of like ICT?

KW: Em, ye

MC: In terms of ...do they have any role in terms delivery?

KW: Yer they do, yer that's right. Mm actually we're actually that's a good point that, actually what we are actually doing is using those as HUBS so we are actually using them as training centres as HUBS to develop into clusters, around their area of specialism so we look to the schools with specialist status to drive and support networks along side anything that we do as well in the local authority as a partnership.

GM: So they way that you are using these specialist people, is it just skills or is it skills and pedagogy or is it both?

KW: I would say it is skills, it's skills development, it's understanding and looking at the learning potential of these elements but it is also looking at aspects of pedagogy as well. How, not how to teach but different ways of teaching and different developments that you can use in your classroom to link, and it's good and again because we find that they actually bring people together to enable them to share their expertise and ideas. So it it's definitely a move away from the traditional model of the LEA at the centre but we are working very closely with the specialist schools to really get them to take on some of that training.

GM: Mm.

MC: Interestingly it seems to be the model a lot, I was saying to you earlier on in terms of you know, Kirklees is an unusual model in that it has a full curriculum team of advisors within the authority and within term of the longevity of that, I don't think there is any, so I mean, obviously I think it is something that Kirklees needs to look at is the

role of the networks, primary networks looking at the role of the you know the specialist colleges in terms of support and we have a strong team of AST's as well that erm, more so in secondary that are starting to pick up and do some of the kind of network, networking em roles, really but em, but I mean this is it really....

GM: Do you think this is em...

KW: Yer, we have...

GM: Can I go back to...

KW: We have 35 AST's, sorry...

GM: No, no.

KW: ...we have 35 AST's of em 6 probably, slightly weighted towards secondary but not much we've got a good range of primary AST's who work cross-phase KS1,2 and cover all aspects of things that you have said there, networking, support individual em individual support within a school to a current coordinator, leading groups, very, very effective for us.

GM: Do you think this is something the government had in mind by setting AST's and these specialist colleges because they have obviously cut down on funding, haven't they that come to local authorities? Em, do you think that they hoped this model might work through this developing?

MC: This is the case with specialist colleges because it is a part of their targets to actually reach out to feeder schools and work in the community's and particularly you know a lot of them are. When I came from Ossett, which was a Technology College, worked, you know relatively with their family of schools, so you know I think it goes hand-in-hand with the specialist colleges.

KW: It's very much driven by the schools.

MC: It is yer.

KW: It's very much down to their needs and again I suppose it's down to the school's self-evaluation and what you are good at and knowing what you need and then the local authority brokering that support and helping you make the networks and connections if you need them.

GM: Great, thank you. Em, do you think, what needs to be done to ensure that teachers are aware of the variety of hard ware and soft ware available to them? Do we need more of the colleges to, the specialist colleges to start to start? One suggestion from one teacher was for example to set up some sort of library system that people would view the programs and rated them for ease of use, appropriateness to what the programs supposedly written for?

MC: Yer, I mean we have, I mean, we have a resource centre, does Woolley still have a resource centre in term of? No. We have still, you know, quite elaborate resource centre in terms of which stocks quite a lot of ICT, that are open, it's open to all schools, schools

can join, buy into it we can actually lend resources and other various things, well it's open to all schools to actual go down there and look soft ware and look at resources they've got down there but at the minute a lot of the soft were we're promoting, at the minute, has actually gone through Books +, have you heard of Books +?

GM: Yes, yes.

MC: They do things like lending Libraries and activity boxes where actually they go out, with you know, with a box actually relating to scheme of works so it might be 'Fairground' and within that are little various bits to inspire and engage children and within that might be a little piece of soft ware. That's quite a powerful way of doing it, because you know, it gives a school access to that and where, where it links specifically with, particularly with D & T because primary schools, even after Excellence and Enjoyment are still using the QCA schemes of work seems to work as a crutch.

GM: Absolutely!

MC: It gives that support and they have a wealth of kind of resources that they are still linking into that. If they find soft ware that links it directly into those schemes of work they will take it on board and that's a away in, I think, for lots of, I think there is still an issue in terms of, em, teachers being made aware of that, you know like you were saying before Keith you get the core people coming to the network meetings, but there the tip of the iceberg really in terms of the other schools that are not attending other networks, they're not having that input not seeing what's available, what is being developed in terms of ICT for the subject area, it's how do you get it across to them.

KW: There are certainly some really good HUBs networks out there, but you are right there's certain areas that haven't seen the light of day and or engaged and we work hard as an authority not only to, to make accessible as much as possible but also to engage as much of a wide audience as possible.

GM: A lot of it seems to come back again to teachers wanting to use programs but they either don't seem confident in using them or, in fact I had one interviewee who bought a control program, put it into her computer and thought this is too difficult and has never used it since, and yet they have spent hundreds of pounds on this program.

MC: Yer, yer and the other issue in terms of within my subject area is progression specifically looking at, you know, children who using a drawing package who then go to, you get to year 7 and starting from scratch with a different emphasis. A lot of the work I've been doing recently has been promoting, a lot of the high schools tend to use Text Soft 2D design as a drawing tool which outputs to various, you know, sticker machines and milling machines and laser cutters and various other things, em, to have been promoting that at primary as a drawing tool as been quite successful actually, quite a lot of schools have been taking it on board mainly because it is quite cheap in terms of the like it's \$45 for site license which is nothing really for schools. Also it is fairly simple to use, also you can customize the tools and it's those little things and there again, as I said before it's the teachers in the schools that engage in the networks that are taking that onboard. And that has been very productive, and then with, obviously you've got those skills that are being built you know in year 3, 4, 5, 6 that then take on to year 7 and built on again so..

GM: I went out Normanton way and there is an excellent pyramid of schools there where the primaries were designing things in CAD going to the high school having it made and bringing it back.

MC: That was the job I used to have in Wakefield. I was classified as the 'Manufacturing Coordinator' face to face which is basically linked to primary schools, all the high schools had video conference facilities that was what I used to work with all that high stuff at the end but I think all that has fallen by the way under the advancement of the technology but there was that kind of context of primary schools designing using I think it was 'Mill can design' I forget which it is now, which is like a Denford draw package and send they sent to the school and the technician or what ever or some of the students in some cases would manufacture it and send it.

GM: To take up on your point of progression, the high schools were saying they had had to rethink their ICT programmes and their D & T programmes because the pupils were coming in with so many skills and understanding...

MC: Mm well that's it.

GM: it was a knock on effect and knocking things up.

MC: That was a vision that Wakefield had like you know you are talking, it must when I worked for Wakefield be now 6 or 7 no more than that, 7 or 8 years ago they were doing that and it is only now other schools are starting to pick that up in terms of an idea, when you think of how far ahead of its time it was, in terms of linking ICT from primary right through to secondary.

GM: I mean some of the work that they showed me was really outstanding.

MC: Yer, you find that a lot of the pyramids are not under the same head, I think Airedale did it em, Kettlethorpe did it, there's lots of schools that did it. All that, I think it went into something like 12 high schools did the soft ware and the manufacturing capability, and with the idea that they rolled that out to their feeder schools. Where they was still doing that, I don't know. That's the kind of thing we are trying to get off the ground.

GM: Well they certainly were eighteen months ago.

MC: That was the success of that was down to funding you see. There were a lot of little pots linked together linked into the single regeneration budget that was working in lots and lots of the areas in Wakefield at the time and that was put directly into buying of the equipment with and obviously paid for a lot of the training, which you know we were talking earlier on about the obstacle of the issue of funding teachers out of school that's why, you know, that's why there is this gap in development for lots of teachers.

GM: One of the things that, one of my questions I'd posed in the questionnaire and in the face to face interviews with teachers was 'What would they like to see for the future' and part of the problem that I saw was the lack of, mm, understanding of current, even current hardware. They could see no further than just maybe each child having a computer terminal.

How do you think authorities could raise teacher awareness of new hardware that comes onto the market.

MC: Have you an answer?

GM: I was hoping you'd tell me.

MC: (Laugh) If I knew that we'd be away I think.

GM: First of all I think it's two problems. First of all it's general interest in ICT and moving things forward and this is a sexist comment. A lot of teachers in primary are ladies and older ladies who will run with the hardware once it's in there and they know what to do because it seems that interactive white boards have completely turned around their perception of ICT and surprisingly enough the largest numbers of ICT are teachers between the ages of 30 and 40. During my interviews it came up that was because they were secondary schools when computers were just coming in and they weren't stable and they'd crash, they took ages to load up and you couldn't do a lot with them, so they were turned off. And now they are just beginning to appreciate what advances have been made, so it seems and ladies, and older ladies as well, are using ICT more than the men. In my questionnaire it came out that just under half of the men were not using ICT. Which surprised me, it sort of killed this urban myth that women are not interested in ICT. And yet when you start talking about 'blogging' and things like, that they haven't a clue. I just wondered if there was any way that you can see being able to keep them up to date because ICT is moving so fast.

MC: Well it is and the problem is schools are becoming more kind of, apart from things like primary networks and networks that they attend through subjects and things like that but they are becoming very insular places. You're having schools are working very much as silos, and it is only when they start to work together, and I can think of examples in primary networks where...

KW: Yer, we use those a lot, to, to really get to get schools to work together...

MC: ...and it's the case, you know, where you would have one school that is extemporatory in its use of the interactive whiteboard and they get together and that is shared, and it is through that that's the best way of promoting...

KW: ...and the VLE's, we use the VLE's a lot as a away of raising awareness. But there is an issue around the number of staff who access them and how often they access them.

GM: We have the same problem with our staff, because we use Blackboard and the number of staff who wouldn't know how to load anything into Blackboard for students to access.

MC: It goes deeper than that. As an authority, I know advisors, and I know for a fact, I know a lot of my colleagues go into school and don't use a Smartboard when they are doing, it's something as simple as that. If we are expecting schools to use a Smartboard and take the technology on it should be an expectation that if you are going to go and lead a course in Literacy that you are going to use a Smartboard. That is changing, that is something the authority has looked at and needs to be addressed with the expectation

that if we go into school and train, we do use a Smartboard. So it wasn't the case maybe a year ago, strange really.

GM: Well HMI have done an audit of the university and that is one of the things that they were say was good at Huddersfield, the fact that staff use things like interactive whiteboards as exemplars for students to follow and use in schools.

MC: For me, in terms of particularly D & T, the thing with, in a secondary context you find a lot more departments would subscribe to 'Data', the Design and Technology Association, which is an invaluable tool in terms of the literature that comes into school that keeps them aware of the latest software and advancements and exemplar work from various schools but it is targeted at secondary and primary, you find in primary schools hardly anyone, even the D & T coordinator will subscribe to DATA, maybe it is something to do with the cost but it's just not a model that's taken onboard. And it is the same with the things like you know the BETs, may be something like the D & T show you get a lot more secondary that go and attend that on an annual basis, so obviously the venue is were you get to speed with what advances have been made, what new software and hardware is out there. But primary don't do that you see and that's, you know, partly because there's no funding to send them down there and partly, I don't know, there's not that commitment to go down on the week-end in their own time which we do in the secondary context. I think that is an issue as well.

GM: I think also the fact that D & T, as a subject, doesn't have a high profile.

MC: Yer, yer I mean it's a foundation subject obviously and I mean, like other foundation subjects it's em...

GM: ...shoved to one side.

MC: Yer, well yer. You're talking to what you know to the end of April and well May 21st. and when SAT's are finished. Then you are talking about schools well take onboard a bit of art, a bit of D & T and this kind of stuff.

KW: Yer, we're exactly the same.

MC: So, we're fighting against that, you know, in terms of, and it's the same with the funding obviously. There's funding there for these core subjects to get teachers out of school to regular networks. The networks for the core subjects are held in school time, you know, which you might not think is a lot but then when you are expecting D & T coordinators to give up their time at 4.30

KW: The focus within school improvement plans and within school improvement priorities is driven by core subjects. And you're right; Foundation Subjects are poor relations...

GM: It all comes back to league tables...

MC: Well it's all driven; it's all driven basically, by, by inspection mostly because there's no published data for D & T in primary schools, there is, you know, limited data, out there that various school have published in term of assessment. In recent OfSTED

inspections of Kirklees primary schools has highlighted, erm assessment in foundation subjects is an issue. In one or two they have actually highlighted D & T as an issue, assessment in D & T and that's when I get called in. So you know it's all driven by that basically, they have highlighted an issues through inspection then the school...

KW: ...then suddenly becomes a priority.

MC: ... yer it becomes a priority.

KW: and therefore funding follows, time follows. It goes up the list of priorities and you've got it. But as soon as it's a lesser an issue, it drops again.

MC: And predominantly, you know, the school improvement priorities tend to be core subjects. Literacy, numeracy based...

GM: For obvious reasons.

MC: ...because of published tables, yer. So that's the obstacle you have got to get over really. Because a lot of what I do particularly is just chipping, chipping at the surface really, basically. Doing things like networks and things....

GM: Funding seems to be a real issue, doesn't it?

MC: Oh definitely. That's the crux of the whole matter.

KW: It's where they identify the priority and the need, and it doesn't tend to be around the foundation subjects or D & T. We can have intensive support plans; we can have action plans, all around literacy and numeracy targets but when you look at the broader curriculum, it's very rarely there.

MC: A lot of the work I do now in D & T which has been more successful because it links into the schools own agenda, so a lot of the schools have been looking at 'Excellence and Enjoyment' and been looking at moving away from QCA schemes of work and looking at going back to, most would call it Topic work, well but back to the type of project based work where they are looking at linking a number of subjects together so a lot of courses that have been over subscribed have been the ones I've done, where we've done D & T and History and linked projects in D & T and History or D & T and Music. So, when, because that fits into their agenda of 'Excellence and Enjoyment' and building these new projects, you know, you've got the attendance there and through that attendance then it gives you that opportunity to give the other messages that you want to get across and share the information you want to share with them.

KW: It's an interesting point that, because we got some funding for Creative Partnerships, em and we had in the first phase, we had three secondary schools and two special schools that were looking to making their curriculum more creative. In phase two we have got 25 schools, 19 out of those 25 are primary schools and they are all around creative approaches to teaching and learning with elements of ICT, art, music, dance, drama and aspects of D & T and Humanities. So as you say, we are chipping away but the sustainability for us beyond 2008 and how we can support schools who clearly want to move that way but there is this dichotomy between feeling yes that's what we want to

do and have a more stimulating curriculum but all the time you've got the OfSTED and the standards issue at the back of it. But we do feel that at least by developing creative partnerships that schools do have opportunities to look at different ways of using ICT, different ways of delivering curriculum.

MC: A lot of comes from I mean, we used to, as a region, have a regional primary D & T conference once every two years. It was twice held at Woolley and they were quite well attended from primary school from right across the region, purely because it was the only advice on D & T you know. We don't have that kind of regional group anymore. We used to advisers in D & T in Barnsley, Sheffield and various other areas, and they were quite powerful vehicles. But, you know, it's still, finding those links, like using people like 'Set Point' who are into stem funding and they'll fund certain activities like, you know, we're doing a bridge building challenge with primary schools in KS2 and it's their funding that then releases teachers to come to the training so its tapping into bits and pieces like that that, that, I say are drips and drops of input really that you are finding funding for.

GM: It seems to be two-fold thing them doesn't it in that the funding again and the fact that the structures within the local authorities have changed, I mean you're very focused on ICT, where as Keith you've got such a broad umbrella to look at that things can pass you by.

KW: You rely on people within the service to pick things up and pass that information to you, use your networks and use your advisory colleagues but in terms, I mean I came from a subject, with a strong subject base, in Doncaster where we had a team of subject advisors and again now I think now apart from core you may have got, there's no D & T, no humanities, no MFL you've got, you've still got a very small core. And like you were saying about the Humanities networks, and therefore what I've got to do in terms of brokerage and support and CPD in Wakefield is very different to how we used to operate. You really have to look at anything in terms of contacts, brokerage, buying in arranging bespoke training. Very difficult where you have not got that strong subject network base any more. We use, we do use other colleagues from Kirklees and from Leeds and Doncaster where we can, but that knowledge of that network is very difficult to how it used to be. Just a fact.

MC: But then, I suppose that's what we were saying earlier on in terms, it's the power of these networks that are going to underpin it now.

KW: Yes that's right.

GM: It would appear to wouldn't it.

MC: Yer.

KW: So now we are looking at other drivers, other ways of modeling that.

MC: But I mean a lot the consultancies I get now is out of my authority actually, so you know I'm getting a lot like Calderdale and places like this are actually asking for supporting in D & T 'cos I'm the only D & T person around basically you know, until those networks are up and running and effective within those authorities so there's lots of stuff.

GM: So maybe you won't get your P45 just yet.

MC: No, no, no. Only the things is there's still lots of independent consultants, I mean, those people that did have the jobs out there, you still tend to find they've either moved roles within the authority they are still there knocking around, like Sandra Horrich is the ex-D & T advisor here she still, although she probable doesn't do any D & T within the authority, she's...

KW: We had some, we did some work at Freestone, in November and we had to buy in from Doncaster. So...

GM: So it is putting all different complexities on local authorities then?

KW: Mmmm.