Already at a disadvantage? ICT in the home and children's preparation for primary school

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About the authors

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Preface

This study

The aim of this study is to investigate the impact of socio-economic disadvantage on pre-school children's development of competences in information and communications technologies (ICT). The study focuses on children's experiences of ICT in the home and in pre-school settings in the year before they begin formal education, and seeks to investigate concepts of advantage and disadvantage in this context. The study also aims to investigate teachers' perceptions of children's ICT competences on entry to school.

The research is based on:
- a survey of the views of parents of children aged 3 to 5, who were attending eight nurseries in two local authorities in central Scotland
- case studies of 16 children, aged 3 to 5, from families selected following the survey; eight of these families are defined as 'disadvantaged' and eight as 'more advantaged'
- interviews and discussions with pre-school staff and observations of children's activities in the eight nurseries, collected as part of the *Interplay* project, with which this study is linked
- interviews with staff from four of the primary schools which some of the children from the project nurseries were likely to attend in due course.

Definitions

In use throughout this report are three terms which require careful definition. These are 'pre-school', 'information and communications technologies (ICT)' and 'disadvantaged socio-economic status'.

Pre-school
Almost all four-year-olds (99 per cent) and over four fifths (83 per cent) of three-year-olds in Scotland are in part-time pre-school education, funded by the government and provided by the public, private or voluntary sectors (Scottish Executive Education Department, 2003). Provision ranges from nursery classes in primary schools to playgroups run by volunteers. For concision, pre-school providers are sometimes referred to as 'nurseries' in this report. There is considerable diversity in the qualifications of adults employed in pre-school settings and we refer to them here as practitioners or pre-school staff, rather than teachers.

Information and communications technologies (ICT)
Becta (2002) lists a number of products available to young children that incorporate some aspect of ICT. These include activity centres, musical keyboards, tape recorders, programmable and radio-controlled toys as well as everyday items such as remote-control devices, photocopiers, telephones, fax machines, televisions and computers. For the purposes of the study we used a similarly broad definition of ICT that encompassed a variety of audio–video resources, 'smart' toys and everyday technologies. We have also included toys that simulate appliances such as mobile phones, laptops, cash registers, microwaves and barcode readers. This is because, in common with the Scottish policy framework for ICT in the early years (Learning and Teaching Scotland, 2003), our starting point is that ICT is embedded in a range of children's everyday experiences. This broad definition contrasts with a widely held view of ICT as consisting mainly of desktop computers and peripherals.

If we define ICT strictly in terms of *information and communications technologies*, then not all of these products have the functionality to demonstrate these features. Many of the toys used in nurseries or at home are electronic, but the level of information or communication created by flashing lights or the production of sounds such as animal noises is minimal by adults' standards. However, many of these products can serve to familiarise children with a concept of *interactivity* in which pushing a button or squeezing a toy's body part produces a response and we see this operational interactivity as another defining property of ICT.

This broad definition is equivalent to the now commonplace understanding of the texts to which children are exposed when they are learning to read, such as advertisements, magazines, labels, signs, lists and newspapers, as 'environmental print'. A more traditional definition of literacy texts

would focus solely on printed books in the same way that the 'traditional' definition of ICT tends to refer solely to computers.

Disadvantaged socio-economic status
Tackling child poverty has been a major focus of the Labour Government since 1997, both across the UK as a whole (Department of Health, 1999; Bradshaw, 2001) and in Scotland (Brown *et al.*, 2002). Currently, just under a third (30 per cent) of Scottish children are growing up in low-income families, officially defined as families whose income is 60 per cent or less than the average UK wage (Scottish Executive Statistics Unit, 2003). For the financial year 2001/2, average *net* income across the UK, including earnings, tax credits, benefits, grants and pensions, was £274 a week. Low-income families are therefore defined as those with a net income of £164 a week or less (under £8500 annually).

Many commentators argue that living on a low income means not simply experiencing material hardship and that it is also often linked to other factors which together contribute to a more complex concept of disadvantage. For example, social exclusion is identified as both a cause and an effect of poverty, though not all poor people may feel themselves to be socially excluded, and not all those who experience social exclusion are poor. Low income also has an impact on quality of life but other factors are also influential, such as family and social relationships, the impact of crime on a community, or the availability of a range of leisure facilities. (See McKendrick *et al.*, 2003, for a detailed discussion of these issues.)

In this study, we use the term 'disadvantaged socio-economic status' to refer to families who are on a low income (60 per cent or less than the average national wage), and who may also be socially disadvantaged as a result of social exclusion or diminished quality of life. These families' experiences of ICT may therefore be limited primarily on financial grounds. They may not have the money to purchase the range of technological items which more affluent families can afford. They may not be able to update their technology as regularly. They may not be able to finance the continuing use of new technologies (replacing batteries, repairing equipment or paying mobile phone bills, for example) to the same extent.

These families may also experience disadvantage as a result of social exclusion. For example, they may not have access to educational provision which would enable them to make the best use of the equipment they possess. They may not belong to networks of people who make regular use of ICT in order to be able to share and develop knowledge and skills collectively. Quality of life may also have an impact. Low-paid workers who work extra shifts or have two jobs may have limited time and energy to explore the potential of ICT. Lone parents, those who care for elderly or disabled relatives, and those who themselves have disabilities, may experience similar obstacles. In identifying families to take part in this study we have therefore focused firstly on income but subsequently on other factors such as living in a deprived area, family members with disabilities or suffering from long-term illness, unemployment or low-level educational qualifications.

Linked project

This research is linked to *Interplay: Play, Learning and ICT in Pre-school Education*, a two-year study funded by the Economic and Social Research Council (ESRC) Teaching and Learning Research Programme. The aim of *Interplay* is to observe and analyse current practice in nurseries, and identify ways of enhancing young children's experiences with ICT through guided interaction with practitioners, peers and parents.

This research extends the work of *Interplay* by:
- focusing in more detail on children's home experiences of ICT
- addressing transfer from pre-school to primary school
- considering concepts of advantage and disadvantage in this context.

Executive Summary

Already at a disadvantage?

This research investigates the impact of socio-economic disadvantage on pre-school children's development of ICT competences at home. The research on which it is based took place between August 2003 and March 2004, and involved:
- a survey of parents whose children were attending eight nurseries in central Scotland
- case studies of eight 'disadvantaged' and eight 'more advantaged' children, aged 3 to 5
- interviews with staff in four primary schools linked to the nurseries.

The research also draws on data collected from a concurrent linked study, *Interplay*, which focuses on children's developing ICT competences in pre-school settings.

Context

The assumption underlying this study is that young children who have varied and extensive access to ICT at home may be in a better position to take advantage of the opportunities to learn about and with ICT when they start primary school. Children's early experiences with ICT at home are likely to be affected by their families' socio-economic status – for example, their income, the educational and work backgrounds of adult family members, their families' and communities' cultural affiliations and, more specifically, their families' interest and expertise in relation to ICT.

There is a considerable body of research establishing links between socio-economic disadvantage and subsequent educational disadvantage. More recently, concern about the 'digital divide' has raised similar questions about the potential for educational disadvantage among children growing up in families with limited access to ICT, although there has been little qualitative research to date on this issue. One model on which researchers might draw to explore these issues is that developed in the context of 'new literacies' studies. This focuses on the social contexts in which people develop and make use of skills or competences (such as literacy or numeracy) outside formal education. Work in this tradition indicates that to counter educational disadvantage, it is necessary not only to consider the distribution of resources but also to change attitudes within educational establishments.

Policy

Scotland and England have different (but largely complementary) sets of guidance for pre-school and primary practitioners on the development of ICT competences. Both countries recognise the need for pre-school practitioners to take account of children's home experiences with ICT, and the Scottish guidance makes explicit reference to the broad range of ICT items pre-school children may encounter. As they make the transition from pre-school to primary, the emphasis seems to shift from a wider to a narrower definition of ICT (that is, mainly computers) and to learning with ICT.

Findings

Our findings focus on three issues:
- the ICT competences young children are developing at home
- the impact of socio-economic disadvantage on these developing competences
- the links between children's home experiences and pre-school and primary practice.

A. ICT competences
We found that children are developing three types of competence: technical, cultural and learning. *Technical* competence refers to the ability to switch items off and on, and conduct other necessary operations for the desired activity. *Cultural* competence refers to children's understanding of the social roles which ICT plays, and to their ability to harness ICT for a range of social and cultural purposes, such as communication, work, self-expression or entertainment. *Learning* competence is a subset of cultural competence, but one of particular significance to young children. In this study, we found that ICT was being used at home to support early literacy and numeracy, communication and musical skills, and also had a role to play in helping children learn how to learn.

In each case, the degree of competence children had acquired was dependent on a number of factors, including access to equipment, support in learning to use it, and the particular interests and aptitudes of older family members.

The impact of socio-economic disadvantage
We found it difficult to establish the impact of socio-economic disadvantage *per se* on these developing competences, principally because of the complexity of the family contexts we studied. For example, although income is likely to affect the amount and the quality of equipment families possess, resourceful families on low incomes found ways of acquiring the equipment they wanted. Children growing up in disadvantaged families who were enthusiastic about ICT may be exposed to a wider range of activities and experiences involving ICT than children in more affluent families whose parents restrict access or are less interested in involving young children in ICT-based activities. Furthermore, the very wide range of activities in which children from different families were engaged made direct comparisons difficult.

Links between home and pre-school
We found few links between children's developing competences at home and at pre-school. Although pre-school practitioners had ways of informing parents about their children's activities and development at the nursery (including their engagement with ICT), staff were less well informed about children's ICT activities outside school – most of the practitioners, when asked if they knew anything about the children's use of ICT at home, said that they did not. Some staff expressed negative views about the amount of TV children watched, or about the kinds of games they played. The main concern of pre-school practitioners was the development of certain basic technical skills, in particular those associated with computers.

Transition to primary school
A similar picture emerged in relation to primary school perspectives, with little systematic collection of information about children's home experiences. Teachers relied largely on anecdotal evidence or on their own assumptions about the relationship between socio-economic status and the kinds of ICT activities in which children from disadvantaged or more advantaged families might engage. The kinds of competences which teachers expected to develop in the early years of primary school related principally to the use of computers, and were largely of a technical nature, supporting children's school-based learning with ICT.

Discussion

Our findings suggest that currently pre-school and primary practitioners have limited knowledge of children's home experiences of ICT and that they are therefore not in a position to build on these skills. Moreover, the kinds of ICT-related skills which primary schools seek to develop in their pupils have little in common with the competences that they are developing at home. For these reasons, we argue that, in the short term, children with limited home experience of ICT are unlikely to be disadvantaged on entering school, as the kinds of competences expected are of a low level and will have been developed in the pre-school. In the longer term, the impact of disadvantage is difficult to establish, because we do not know enough about the ways in which children's earlier experiences are likely to influence their learning, and whether or not schools overtly take these into account

Recommendations

We recommend that a more substantial study addressing the issues raised by this research is conducted, particularly in order to explore the longer term effects of children's different experiences of ICT at home, now and in the future. We suggest that policy-makers may wish to reflect both on the impact which these experiences may have on children's learning and on the potential to build on children's developing competences in a range of educational contexts. We also recommend training for practitioners which draws their attention to the nature of children's home experiences of ICT and to the cultural and educational value of these experiences.

However, if pre-school and primary schools are successful in recognising children's developing competences and in finding ways of integrating and further developing these, they will also have to consider how best to support children whose home experiences of ICT are limited.

Introduction

The starting point

The starting point for this study is that children who have varied and extensive access to ICT in their homes and at pre-school may be in a better position to take advantage of the opportunities in primary school to learn to use ICT and to learn via ICT, than those with limited or no prior experience. A number of factors are likely to influence the range and extent of access to ICT available to pre-school children, at home and in pre-school settings. These include the socio-economic status of their families; familiarity within their families and in the wider community with the range of uses to which ICT can be put, and a corresponding range of opportunities for using it; and the expertise and enthusiasm of pre-school practitioners for ICT. This report focuses principally on the first two of these factors, and makes some reference to the third, which is the more substantive focus of *Interplay*, the study linked to this research.

Links between socio-economic and educational disadvantage

There is a well established view, dating back at least to the Plowden Report (Central Advisory Council for Education, 1967), that socio-economic disadvantage translates into educational disadvantage. This is understood as manifesting itself initially in poor levels of literacy and numeracy, and, subsequently, in low levels of attainment in national examinations. Considerable research and policy activity have been invested in identifying and combating elements of this vicious circle. For example, it is often argued that children of pre-school age from socio-economically disadvantaged families have more limited opportunities to develop the kinds of literacy skills which will be valuable to them when they start school, compared with children from more advantaged families. Consequently, a number of government initiatives such as SureStart and BookStart (also known as Books for Babies) have been introduced to enable these children to gain greater experience and skills before they start school. Complementary school-based policies, such as the literacy hour in England and early intervention in Scotland, have been devised to ensure that as many children as possible have acquired age-appropriate levels of literacy by the end of primary school, and are able to cope with the demands of the secondary curriculum.

Links between socio-economic disadvantage and ICT disadvantage: the 'digital divide'

Concern that socio-economic disadvantage may affect children's opportunities to engage with ICT and lead to educational disadvantage, is one of the issues raised by the 'digital divide'. Becta's review (2001) of the literature on this issue defines the term 'at the broadest level to refer to the gap between those individuals and communities who own, access and effectively use ICT and those who do not' (p.3). The review makes reference to the implications of the divide for education and standards, economic competitiveness and employment, and social inclusion, including citizenship and participation.

There is an extensive body of work setting out to map the digital divide, largely through quantitative means, in terms of ownership and access. Surveys conducted in 2002 showed that around three quarters of UK families with school-aged children had PCs in the home (Hayward *et al*., 2002), and that about half had digital television (BBC, 2002). Four fifths of such families had internet access. These surveys reveal that the impact of disadvantage on ICT access in the home is complex. For example, the study by Hayward *et al*. shows that almost all (93 per cent) children in social classes A/B had personal computers at home, compared with under two thirds (60 per cent) of children in social classes D/E. However, children in the latter group were more likely than children in the former to have access to a games console (79 per cent compared with 70), and there was very little difference in mobile phone ownership (93 per cent for children in social classes A/B compared with 88 per cent for those in social classes D/E).

There has been limited qualitative work exploring the implications of the statistics gathered. For example, the fact that a household possesses ICT equipment does not mean that everyone in the family makes use of it; nor does lack of ownership mean that people have no access to ICT if they can make use of equipment at school, in offices, or in libraries or community centres (Facer *et al*., 2001; Tobin, 1998). Among the few who have addressed such issues, Becker's research (2000)

indicates that children from higher income groups are more likely to use ICT for a wider range of activities than is the case for children from lower income families. However, a study of pre-school children by Brooker and Siraj-Blatchford (2002) did not find strong evidence of socio-economic advantage translating into educational advantage, in relation to ICT, although this work does suggest that the interaction of gender, ethnicity and low income is potentially disadvantageous.

Alternative perspectives: new literacies studies

The notion that children from socio-economically disadvantaged families have limited experience of literacy (and numeracy) in their home or communities has been challenged by a number of researchers working in the field of 'new literacies' studies. Writers such as Heath (1983), Street (1984), Barton and Hamilton (1998) and Gregory and Williams (2000) have established that many such communities have rich cultural traditions. These often draw on a wider range of literacy knowledge and skills than may be available to the kinds of middle-class communities usually held up as role models for children's early literacy. New literacies writers argue that schools tend to hold a narrow view of 'appropriate' literacy development and therefore may not value the experiences of children who are not from middle-class backgrounds. They imply that teachers should develop a broader view of literacy and learn how to harness the wide range of skills which children of all socio-economic backgrounds bring to school to support their learning.

As yet, few researchers have applied these approaches to understanding the ways in which children may learn to use ICT in their homes or communities. Sefton-Green's review of informal learning with ICT (2004) indicates that the approach developed by the new literacy theorists would be of value in this area. Basing his discussion on research into the home use of ICT among children of school age (largely over the age of 11), he argues that the kinds of competences children may be developing with ICT at home have the potential both to support traditional educational goals and also to instigate new kinds of learning. Therefore, it is important that educators learn more about what children are able to do through ICT outside the classroom, and that they value and build on children's existing competences. They also need to re-evaluate the traditional curriculum in the light of emerging new competences which may be of greater relevance in the future. Similar points are made by Marsh (2002; 2003) and Snyder *et al.* (2003).

Policy framework

The Scottish and English education departments have both produced guidance materials to enable practitioners to support the development of ICT competences in the early years.

Scottish policy

The Curriculum Framework for Children 3 to 5 in Scotland (Scottish Consultative Council on the Curriculum, 1999) makes only a passing mention of ICT, noting the use of a computer as one way in which young children become aware of the everyday use of technology. However, in 2003 the Scottish Executive launched an ICT strategy for Early Years (Learning and Teaching Scotland, 2003). This includes a training programme for practitioners and a policy framework for the effective use of ICT in pre-school settings. The framework establishes a broader definition of ICT (beyond desktop computers) and stresses the importance of developing pedagogy and practice for learning about and with ICT across the curriculum. The need to allow for individual learning styles and preferences and children's varying experiences with ICT outside the playroom is explicitly acknowledged. Practitioners are urged to recognise children's use of ICT outside early years settings as an important learning resource; to use the capacity of ICT to support and value cultural diversity; and to take advantage of the opportunities to work with parents that ICT can offer.

For school-age children, the *Information and Communications Technology: 5 -14 National Guidelines* (Learning and Teaching Scotland, 2000) specify seven strands within which children should be developing ICT capability: use of the technology, creating and presenting ideas; collecting and analysing information; searching and researching; communicating and collaborating with others; controlling and modelling and developing informed attitudes about the use of ICT in society. Like the policy framework for ICT in pre-school settings, the *National Guidelines* acknowledge children's exposure to technologies outside school and that the extent of this exposure will vary. However, the attainment goals set out in the *National Guidelines* imply a focus on computer use and on moving children whose entry capabilities may be very diverse towards desired knowledge and skills targets.

English policy

In England, guidance is linked to the National Curriculum. In the *Curriculum Guidance for the Foundation Stage* (QCA, 2000), early learning goals for ICT are identified as part of children's development of *Knowledge and Understanding of the World*. The relevant section describes progression, from showing an interest in ICT to finding out about and identifying the uses of everyday technology and using ICT and programmable toys to support their learning. It also describes the pre-school practitioner's role in supporting progress, including building on the ICT skills children develop at home.

The *Programme of Study for ICT* at Key Stage 1 (QCA, 1998) describes the knowledge, skills and understanding to be developed as follows:

> During Key Stage 1 pupils explore ICT and learn to use it confidently and with purpose to achieve specific outcomes. They start to use ICT to develop their ideas and record their creative work. They become familiar with hardware and software.

The *Programme of Study for ICT* identifies four attainment targets:
- finding things out
- developing ideas and making things happen
- exchanging and sharing information
- reviewing, modifying and evaluating work as it progresses.

The Foundation Stage Profile Handbook (QCA/ DfES, 2003) provides more specific examples of progression in ICT. At Scale Point 1 (shows curiosity and interest by exploring surroundings), the relevant ICT example is 'familiar with everyday technology, e.g. the telephone' (ibid, 2003). At Scale Point 9 (communicates simple planning for investigations and constructions and makes simple records and evaluations of her/his work; identifies and names key features and properties, sometimes linking different experiences, observations and events; begins to explore what it means to belong to a

variety of groups and communities), two examples are provided: 'uses simple software to create a bar chart from a list; uses a CD-ROM to find out what grandparents wore when they were children' (ibid, 2003).

Aims and objectives

The aim of this research is to investigate the impact of socio-economic disadvantage on pre-school children's development of ICT competences.

More specifically, we set out to:

- explore the range of children's experiences with ICT among 'disadvantaged' and 'more advantaged' families
- focus on children's experiences of ICT in the home and in pre-school settings
- investigate teachers' perceptions of ICT competences on entry to school.

We identified six questions to be answered by the research:

1. What *technical* competences with ICT are children developing at home?
2. What *cultural* competences with ICT are children developing at home?
3. What *learning* competences with ICT are children developing at home?
4. Does socio-economic disadvantage make a difference?
5. What links can be made between home and pre-school practices?
6. What expectations do primary schools have of children's ICT competences?

Although the overall aim of this research is ambitious, it is important to acknowledge the small scale of the study. The research is based on case studies of 16 children, aged 3 to 5, and their families, drawn from eight nurseries in central Scotland. We conceptualise this research as a scoping study to identify some of the key issues and we do not claim that we can generalise beyond this sample. Nevertheless, the Discussion section indicates some of the issues that we identify as likely to be of more widespread importance.

Research design

Data collection

The research design for this study was developed to capitalise and build on that of the *Interplay* project which is based in eight nurseries in two local authorities in central Scotland. The participating nurseries were selected by local authority representatives on the basis of a number of criteria. These included an interest in ICT and a willingness to participate in the study. The selection process also recognised the importance of representing a range of types of provision including nurseries serving areas of disadvantage in each authority. A description of each of the participating nurseries is included in Appendix A.

In addition to the data collected for *Interplay*, this study involved:
- a survey of the views of parents of children aged 3 to 5, who were attending eight nurseries in two local authorities in central Scotland
- case studies of 16 families, selected from the survey respondents: eight of the families were defined as 'disadvantaged', having an annual net income of under £10,000 and/ or other circumstances which would be likely to make life difficult (such as none of the adults in the family being employed or one or both parents disabled), while eight families were defined as 'more advantaged' or 'affluent', having an annual net income of over £20,000 and no reported adverse circumstances
- interviews with staff from four of the primary schools which some of the children from the project nurseries were likely to attend in due course.

The survey

In October 2003, questionnaires were sent to all the families of children aged 3 to 5 who were attending the eight nurseries. Of the 405 questionnaires distributed, 204 were returned, a completion rate of 50 per cent. We asked the families what technologies they had at home, and whether their pre-school age children made use of these technologies. We also asked if the children used the technologies on their own, or whether they needed help or supervision by adults. The questionnaire is included as Appendix B.

The case studies

Respondents to the questionnaire were asked to volunteer to participate further in the study, and approximately 40 did so. It was made clear that further participation would be rewarded by store vouchers, which were given to the participating families just before Christmas. Participants were selected to fit the criteria of 'disadvantaged' or 'more advantaged'. In addition, we aimed to include an equal number of families from the two authorities, an equal number of pre-school girls and boys, and an equal number of the age groups across the sample. Table 1 shows the distributions of these characteristics.

Table 1: Characteristics of the 16 case study families

	Advantaged Families								Disadvantaged Families							
Authority	A				B				A				B			
Girl/Boy	G	G	G	B	B	B	B	G	G	G	G	B	G	B	B	B
Age	3	3	4	4	3	3	4	4	3	3	4	4	3	3	4	4

Each case-study family was visited twice, once in November or December 2003, and once in January or February, 2004. Two researchers took part in each visit, in part because it was sometimes necessary for one researcher to entertain the child in order for the other to talk to the parents, but also because it was found that this generated richer data: different researchers noticed different things in the course of the visits, and in some cases it was possible for one researcher to conduct an extended interview with a parent while the other engaged in sustained observation of the child's activities with ICT.

For the first visit, the researchers conducted open-ended discussions around seven themes:
- family and researcher introductions
- technologies in the home
- technology histories
- children's use of technology
- children's play
- children's learning
- children's relationships.

In the period between the first and second visits, the families were asked to complete a week-long diary providing details of activities involving ICT in which their child had participated, and also to take photographs showing the children taking part in such activities. The diaries and the photographs were used mainly as stimuli for the second round of interviews and proved to be a successful method of engaging parents, and the children themselves, in the discussion. As Christmas fell between the two visits, many families acquired new ICT items and parents drew our attention to the ways in which these had enabled their children to develop new competences or build on those which they had discussed with us during the first visit.

Primary staff interviews

We interviewed a member of staff from four of the primary schools associated with the nurseries. There were two primary schools from each local authority. In each case the member of staff interviewed was either the headteacher or a member of staff with particular responsibility for ICT in the school. These interviews focused on primary school teachers' expectations of children's ICT competences as they enter school, their knowledge of children's ICT experiences at nursery and at home, and what they expected children to learn about ICT in the course of their first year of primary

school. We also asked them whether they believed that there was a digital divide, and if so, how primary schools might combat this.

Analysis

Survey data
Analysis of the survey data was conducted using SPSS to generate frequencies and cross-tabulations of the data, focusing in particular on differences between disadvantaged and more advantaged families, and on differences between girls and boys.

Case study data
The case study data consist of a number of items. The discussions which took place during our visits were recorded on tape. These have not been transcribed conventionally in most cases, but written up as summaries of the issues raised, based on subsequent replaying of the tapes, in conjunction with the researchers' recollections of their visits. The summaries contain not only an account of the discussions, but also, for example, notes on children's activities while the discussion was taking place. These data are very rich and have raised a wide variety of issues, summarised in the section on findings. In addition, we have the photographs and diaries which parents compiled between the visits. Their principal function was to act as a stimulus to the second round of interviews, and therefore these data have not been separately analysed.

Analysis of the visit summaries has been based on iterative content analysis, shaped initially by our literature review and subsequently by categories emerging from the data themselves, through extensive discussion amongst the researchers, drawing on perspectives which are both multiple (because different researchers visited different families) and shared (because there were always two researchers on any one visit).

Pre-school and primary staff interviews
Interviews with staff in primary schools and with pre-school practitioners were audio-recorded and transcribed in full. The starting point for the content analysis of both sets of practitioner interviews was the framework of questions posed. Responses were considered first within the framework before they were examined for additional categories of interest or emerging concerns not anticipated by the interviewers.

Findings

Introduction

In seeking to establish whether socio-economic disadvantage has an impact on pre-school children's development of ICT competences, it is necessary first to identify the kinds of ICT activities in which children engage at home, and then to consider what kinds of competences pre-school children are developing, or might develop in this context. We identified three types of competence: technical, cultural and learning. The first section 'developing ICT competences in the home' examines in more detail our findings in relation to each of these competences. In the second section we consider whether socio-economic disadvantage makes a difference to the development of these competences; and in the third section we address the links between home practices and those of the pre-school settings and primary schools.

Developing ICT competences in the home

Children's use of ICT at home
From the diaries compiled by parents, it appeared that ICT items most often used by the case study children were the television and the computer: these represented just over half (56 per cent) of the activities which they chose to describe in detail in the diaries. Other popular home ICT items included electronic books, videos, games consoles and handheld electronic games and music technology (for example CDs, cassette players or karaoke machines).

The amount of time spent on ICT-related activities varied considerably. The shortest daily activity span logged in the diaries was 10 minutes with a tape recorder and the longest was six hours watching videos. Nearly a third of the activities (31%) were sustained for over an hour.

Some gender differences were apparent. Boys seemed to spend more time on ICT-related activities than girls, and to use a wider range of items. Two of the girls for whom diaries were compiled had days when they did not make use of ICT items at all, but none of the boys had ICT-free days.

Technical competences
Technical competences include the ability to switch ICT items on and off and to conduct other operations necessary for the desired activity (for example, rewinding a tape, finding and opening games stored on a computer, or dialling a number on a mobile phone). Technical competences also include the application of knowledge about how games or other applications work, whether instructions for specific games which have been learned and internalised, or a more general ability to apply knowledge derived from earlier experiences to new experiences (such as when playing a game for the first time).

The technical competences demanded by different ICT items vary considerably but, regardless of the type of technology concerned, we found that children's acquisition of these competences is dependent on a number of conditions, including:

- whether they have access to particular types of technology, and whether this access is open or restricted
- whether the technologies to which they have access are appropriate for their age
- whether their parents or other family members or friends are willing and able to teach them how to use the technologies, and to support the children as they learn to use them.

Each of these conditions is discussed in more detail below.

B. Access
Our survey data show that all respondents, regardless of income, possessed televisions, videos and CD or cassette players, while over four fifths owned mobile phones and computers. These, then, are the technologies most accessible to children. Figure 1 summarises our survey findings about the range of technologies families have at home.
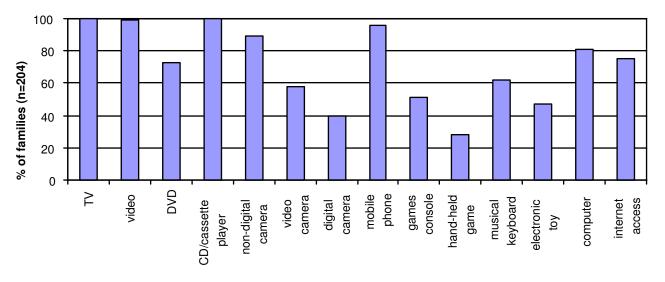

Figure 1: Family ownership of technological items
From our case study data, we found that young children have open access to certain items, but that access to other items may be restricted or prohibited. Restriction appears to depend to a great extent

on the value or the newness of the equipment. For example, case-study parents tended to be unconcerned about their children using the television and video players, but some did not allow them to use remote controls for satellite channels, or to insert or play DVDs without supervision, in case the equipment got broken or the channelling system was scrambled. Most case-study parents with mobile phones locked them to ensure that children did not use them when unsupervised, though some had taught children how to use the speed dial function so that they could call friends and relatives. Children's ability to use ICT items thus depends not only on whether these items are available in the home, but also on the degree of access permitted by parents.

C. <u>Age-appropriate technology</u>

In some cases, parents explained their policies of restricted access on the basis that they did not think certain items were appropriate for children of pre-school age. These views were expressed not only in relation to adult-owned items such as mobile phones and video cameras, but also to items such as games consoles or hand-held electronic games which were seen as more appropriate for older children. The case study data suggest that while parents may invoke age appropriateness to protect valuable equipment that may not, in fact, be beyond their child's competence (using remote controls, for example), many games items are technically challenging for children of this age. However, games manufacturers seem to be becoming more aware of the interests and abilities of pre-school children. We encountered special controls geared to the motor skills of young children, and electronic games based on cartoons or TV programmes aimed at very young children, and involving very simple, but apparently engaging, tasks. In these circumstances, some children become enthusiastic game players.

D. <u>Support for learning to use ICT</u>

Most of the children in our case studies had already learned how to use battery-operated toys and the basic controls for items such as televisions or CD players. They could – and did – use these independently, when access was unrestricted.

Parents, older siblings and other friends and relatives played a key role in enabling young children to learn to use more complex ICT items. For example, some parents were in the process of teaching their children how to use computers: we observed a parent showing a child how to click a mouse, and how to close down a computer correctly. One or two of the case-study children were using adult computers with some (sometimes very limited) adult supervision. These children could switch computers on, find the games or activities they wanted to play, play the games (using a mouse or other peripherals) and print out drawings or other work virtually without help. However, many of the children needed someone to explain the instructions for games the first time, as these tend to be written and therefore inaccessible to children who cannot read. Once they understood the rules of the game, they could play independently. Some games designed for young children provide oral instructions – and in these cases, children needed considerably less help from parents, although they sometimes had to be reminded to listen and follow the instructions.

<u>Cultural competences</u>

Cultural competences entail an understanding of the roles which ICT plays in society and an ability to harness ICT for a range of social and cultural purposes. Children's understanding of the social roles of ICT may derive from their experiences in the home, in their communities, and at pre-school, and perhaps also from books, films and television programmes. These experiences may have introduced them, for example, to the communicative role of ICT, its role in facilitating a range of work-related tasks, its potential to support self-expression, and its entertainment role.

We summarise here our findings in relation to these first four roles – communication, work, self expression and entertainment. Learning, which is of particular significance for young children, is addressed in the following subsection.

E. <u>Communication</u>

All of our case-study children were exposed to the role of ICT in supporting communication at a distance, with family and friends, mainly by telephone (landline and mobile), and from 'familiar strangers' such as television presenters and newsreaders, for example. Some children also had experience of email and other internet-based communication, including the use of webcams. In their imaginative play, particularly in the nursery, they were encouraged to use toy telephones (landline

and mobile). However, most children of this age seem to have limited opportunities to use real equipment themselves for a variety of reasons. As noted earlier, parents tried to keep a careful eye on their telephones (for example, keeping their mobile phones locked), to prevent children from making accidental calls, running up large bills inadvertently or making nuisance calls. Some children's parents used email to communicate with distant friends or for work purposes, although in these cases too, it seemed that young children are not particularly encouraged to use this medium themselves, presumably because of their lack of reading and writing skills. In some families, parents were helping their children learn how to communicate via ICT, for example by dialling the telephone numbers of friends or relatives themselves and letting children speak, or by allowing them to use the speed dial function to call listed contacts. One family had installed a webcam in order to communicate with relatives in the USA, and had encouraged their son to develop a relationship with them in this way.

F. Work

Although the children in our study are generally too young to make use of ICT for work purposes, they see adults and older children use ICT to facilitate work tasks in the home and in the community, in a variety of contexts. In the home, washing machines, dishwashers, microwaves and other programmable machines are commonplace and several of the children (mainly girls) had toy versions of such machines, to use as props for imaginative play. One boy was learning to use the washing machine. Similarly, children see cash registers and bar-code scanners used when shopping with their parents and some had toy versions to play with at home or in pre-school.

Some children's parents worked from home, using computers for a variety of work purposes, including reading and sending email and using the internet to research topics for work purposes. These children are thus familiar with the notion that computers are used in work contexts, but may not have a very detailed idea of the range of technologies in use, or their functions. One child, whose father was a designer, had some design functions set up on his own computer. However, the potential of ICT to convey information in an appropriate form for young children seems relatively underdeveloped. The internet and other information-bearing technologies such as CD-ROMs are difficult for children to access because of their reliance on the written word, despite the potential of these media to use other forms. However, children's interest in wildlife documentaries on television was noted by several parents, and it seems likely that television and other technologies which habitually present information in visual form (such as videos and DVDs) are the most obvious ICT-based sources of information for children of this age.

G. Self-expression

An important function of ICT in the family context is in recording family events and allowing these to be reviewed or replayed subsequently. Traditional and digital cameras (still and video) play a key role in this context. Some of the case-study families had highly developed practices in this regard, while others had little interest in such activities. Almost from birth, the majority of our case study children had experience of others taking photographs or videos of them, and of these being displayed or played back at a later date. As these children grew older, they became increasingly interested in seeing themselves as babies, and remembering family events, such as Christmas or birthday gatherings and holidays.

However, young children rarely took photographs or videos themselves. The equipment was regarded as too fragile for them to handle and too complicated for them to use. Traditional cameras also pose the problem of wasted film and associated costs. But the case studies provided some evidence of changing attitudes as parents became more familiar with the equipment and particularly with the 'infinite' capacity of digital cameras to take photographs which can be instantly discarded at no cost if valueless. Some of the children in our study had been allowed to use mobile phone cameras and other types of photographic equipment.

H. Entertainment

Our data indicates that ICT fulfils a very wide range of entertainment functions for children in the case study families. Television, video and DVD players are virtually universal features in the homes of the children in our case studies. All the children had extensive experience of watching television programmes, cartoons and films on screen. They also listen to music, particularly nursery rhymes and other songs aimed specifically at young children. Some children have their own cassette or CD players at home, and have collections of cassettes or DVDs (in addition to access to the collections of

other family members). Learning songs and singing along with the presenter is also a feature of children's television programmes, videos or DVDs. Several families possessed cassette players with microphones, which enable children to sing along, and in one family, a full-sized karaoke machine had been purchased as a Christmas present for the four-year-old boy participating in the study.

The range of computer and video game playing equipment which families possess differs considerably from household to household and, as a consequence, the opportunities which children have to play games, and the kinds of games they play, are very varied. In this context, young children with older siblings or, on occasion, fathers who retain an interest in game playing, are privileged compared with those who are the oldest children in the family and those whose parents are not interested in game playing. This kind of equipment is very rarely bought specifically for children of this age, and therefore, to gain expertise, young children need to have access to equipment belonging to others, and support in learning how to play games from older and more experienced family members.

Learning competences

Learning competences are an important subset of the cultural function of ICT given the high level of interest among parents and educationalists (and commercial companies) in the potential of ICT for enhancing learning among pre-school and school-aged children. Perhaps the most obvious area in which ICT is expected to support young children's learning is in relation to early literacy and numeracy, but, in the course of the research, we also identified the potential of these technologies to support children's communication skills, music, and learning how to learn.

I.   Literacy and numeracy

Parents saw one of the main educational functions of a range of ICT items as being to support children's development of early literacy and numeracy skills. The items which are primarily associated with this type of activity are 'mini computers', *LeapPads* and certain types of computer games. 'Mini computers' and toy laptops, for example, seem mainly focused on literacy type activities, perhaps because of their dependence on alphabetic keyboards as the main interface. We have seen only a few 'mini computers' in use, and the activities they presented did not seem particularly suitable for children of pre-school age, because they assumed a certain pre-existing level of literacy which few of the children possessed. As they could not read, playing the games tended to involve pressing letters at random until the right answer was achieved, or else they asked parents or older siblings for answers. In some cases, however, the 'mini computer' was reported as having stimulated a desire to learn to read and write. Certain computer games and similar games on children's websites or on interactive television sites for children were similarly overtly designed to teach literacy and numeracy skills. The examples we saw of computer games specifically aimed at children of this age seemed more appropriate than those on the 'mini computers'.

LeapPads involve the use of special books and cartridges from which children can choose a range of activities, activated by the use of a special pen. These activities largely involve hearing the text read aloud, or basic numeracy work. Children who possessed *LeapPads* were said to be enthusiastic users, and parents were convinced of their educational value. However, the researchers found it difficult to establish the extent to which children were acquiring literacy or numeracy skills from these activities.

J.   Communication skills

ICT often acts as a stimulus to children's imaginative play, seen as important in developing communication skills and an understanding of drama and narrative. On several of the home visits, we encountered children who liked to dress up as fairy-tale or comic book heroines and heroes. Often, the stimulus to this type of activity came via television programmes or films, and these children possessed dressing-up clothes which had specific links to such films. Sometimes they re-enacted scenes from programmes or films and invented new adventures for their favourite characters. Another similar form of imaginative play was stimulated by toy versions of ICT items.

Toy telephones (landline and mobile), cash-registers, bar-code scanners and cameras, for example, can also become props in a range of imaginative games, enabling children to represent the role which such items play in people's lives. Old or toy computers seemed most often to be used in imaginative games about school, perhaps indicating that children of this age are already keenly aware of the place of computers in educational environments.

K. Music

Music is a prominent feature of many of the ICT-related activities in which young children engage. For example, in the diaries parents completed for us of their children's activities over a week, a number noted that their children had learned to sing a song from children's programmes. Some children had dance-mats, which can be connected either to a television or to a computer, so that children can dance, following visual instructions. It is also possible to compose tunes, by stepping on different squares on the mat. Tunes are stored by the mat and can replayed. Among our case study families, dance-mats had been bought for girls, although boys in those families were reported to enjoy playing with them too.

Children had a variety of toy musical instruments at home, some acoustic and some electronic, the latter including keyboards, guitars and violins. We did not observe children playing any of these instruments on our visits, though one child was photographed playing a toy guitar. None of the children were reported to be having any formal instruction in learning to play musical instruments of any kind, nor did parents mention providing any informal support or tuition.

L. Learning to learn

Certain ICT items support the development of learning skills *per se*. From the case studies, this was most apparent from some children's computer game play experiences. Through the game play some children had acquired not only the technical skills needed to play games but had also learned about listening to instructions and acting on them (valuable skills for starting school). These children were also reported to be able to spend long periods of time on game play (over an hour in some cases), suggesting that game play may support the development of skills of concentration.

Does socio-economic disadvantage make a difference?

In reporting our findings on developing ICT competences among pre-school children in the previous section, we have not differentiated between children from disadvantaged and more advantaged families. In this section we present our findings in relation to four issues raised by the literature on socio-economic and educational disadvantage, and on the digital divide.

The four issues relate to the impact of:
- low income
- parents' educational backgrounds and experiences with ICT
- social exclusion and quality of life factors
- cultural difference.

As we saw in the Introduction, a number of earlier commentaries on these issues have called for more qualitative work in order to understand them more fully. Although our study is limited in scope and therefore cannot be regarded as providing definitive answers, its value lies in establishing the complexity of these issues, partly because of the wide range of variables to be taken into account, and partly because there is, as yet, no established view on the 'ideal' or most 'appropriate' model of a home environment which supports the development of early ICT competences.

The impact of low income

It is clear that families on low incomes have less money to spend on ICT items than more affluent families. In line with previous surveys, our own survey data shows statistically significant differences between disadvantaged and more affluent families particularly in relation to computer ownership and internet access: the majority of those on a higher income reported owning one or more computers (87 per cent) and had access to the internet (89 per cent), compared to only half (50 per cent) of those on a lower income.

There was also a highly significant relationship between annual income and owning video players, non-digital cameras, mobile phones and CD players. However no relationship was found for the other ICT items listed (TV, DVD, digital camera, game console, electronic handheld game, musical keyboard and robot/smart toy). This may be because these are now viewed either as necessities or as luxuries by all households, regardless of income.

From our case study data, we came across several examples among the disadvantaged families relating to the need to make difficult choices in relation to ICT. One family with a limited budget swapped their computer for a car, while a lone mother, seeking work now that her daughter was about to start school, had to decide whether a computer or a car would be more useful. We also found that disadvantaged families tended to have older equipment than those who are more affluent, that they acquired much of their technology second-hand, and that they often purchased software for their children on the basis of cost rather than content.

However, we also found that some people were very resourceful in overcoming some of the financial barriers which might have limited access to ICT. They were highly knowledgeable about potential sources of second-hand ICT equipment, such as visiting car boot sales and swapping items with friends and neighbours. The resourceful families were then using ICT to save money, by comparing prices online, or by accessing a much wider network of second-hand suppliers than was possible locally – not only for ICT equipment but for a wide range of needs. They had learned to minimise the costs of internet access by seeking out deals which provided free or reduced rates at certain times of day and ensuring that they used the internet only during these periods, or by accessing the internet from libraries or community centres.

The impact of parents' educational backgrounds and experiences with ICT

There are clear differences in the educational backgrounds of the parents from the disadvantaged families in our study, compared with the parents from the affluent families. Among the disadvantaged families, two had no qualifications at all; in five families, the highest qualification was Standard Grade (similar to GCSE) or equivalent; and only one parent had any Highers. None of the parents had a university degree or held any professional qualifications. In contrast, in five of the more affluent families, both parents had at least a first degree or equivalent qualification; in two other families, parents reported holding Highers, A-levels or equivalent, and professional qualifications. Only one affluent family reported O-Grades (the examinations which preceded Standard Grades) as the highest qualification.

There were also differences in their experiences of using ICT, for work or leisure purposes – in particular their use of computers, email and internet facilities. Among the disadvantaged families, only one parent used ICT for work purposes (he ran a small business from home, over the internet). Another father was interested in ICT. In addition to being a keen games consoles player, he was learning to build computers from second-hand parts, and encouraged his children to join in this activity. None of the mothers were working, nor had they used ICT when working in the past, but three were currently on part-time college courses which included some basic training in word processing, email and internet use. One of the mothers was an enthusiastic user of ICT at home, particularly of email and the internet, but the others seemed less confident or uninterested.

In contrast, the parents of the more affluent families had much more extensive day-to-day interaction with ICT. Six of the eight fathers used computers at work and all used home computers for work purposes, for shopping and other leisure purposes. Four of the mothers were working part-time, though none mentioned using ICT in the workplace, and only one of the eight had had a job in the past (for a computer company) in which ICT would have played a key role. However, all had basic computing skills and were able to help their children learn to use various ICT items. Several mothers were very enthusiastic users of email, the internet, chat facilities and webcams; but two were more ambivalent, making little use of ICT themselves, and seeking to restrict their children's access to ICT of various kinds because they believed that too much activity of this kind was damaging for young children.

It seems likely that parents' educational backgrounds, and in particular their own experiences of using ICT, have an impact on the opportunities available to their children at home. Examples from our case studies include a disadvantaged family which disconnected their computer from the internet because they did not know how to use it and seemed unable to get help; another family where the lone mother had no experience of using computers and was unable to help her daughter learn to use equipment which they had in the house. In contrast, among the more affluent families, we encountered families with considerable experience and sometimes specialised skills. For example, a father who was an architect had installed some basic computer-assisted design software on his four-year old son's

computer and taught him to use this and several parents, who were competent internet users, had encouraged their young children to take part in internet-facilitated activities.

However, although the lowest levels of knowledge and experience were found among the disadvantaged families, some of the most enthusiastic users of ICT were also in this group. Some members of disadvantaged families possessed high levels of technical competence and others knew people who could help them to resolve the technical problems to which second-hand equipment (particularly equipment which comes without instructions) may be prone. It is possible that the enforced greater self-sufficiency of such families may mean that their children could develop more sophisticated technical competences than children who live in families with the latest equipment and service contracts.

The impact of social exclusion and quality of life factors
Commentators on socio-economic disadvantage argue that low income is only one of a number of factors contributing to disadvantage. Social exclusion and quality of life are also influential, although they do not always correlate directly with income. Our study suggests that such factors can have an impact on young children's experiences of using ICT, though there were limits to the researchers' ability to raise questions about social exclusion and quality of life in our interviews with parents. We observed, for example, that the four disadvantaged families which were headed by lone mothers, and particularly the two families where the lone mothers were very young, had the lowest incomes of all the disadvantaged families, and it seemed that the mothers were more isolated from the local community than was the case with the other, two-parent families. These were also the families where the children's ICT opportunities were the most limited.

Similarly, the facilities available to the wider community are likely to influence quality of life. In one village, inhabited by three of the disadvantaged families, a community centre with computer and internet facilities had recently closed down. This represented not only the loss of material resources but also of opportunities to learn to use these technologies and for knowledgeable support if things went wrong, whether at the community centre or with home equipment. These factors do not only affect disadvantaged families (though they are more likely to be affected). In another village, where one of the more affluent families lived, broadband was unavailable and internet connections via conventional telephone lines were slow and unreliable, to the great frustration of the family in question.

The impact of cultural difference
On the basis of our case study data, it is not easy to identify cultural differences between the two groups of children. Each child has a wide range of experiences with ICT, and these differ from one family to another, so that it is difficult to make direct comparisons between the two groups. For example, although all the children had extensive experience of watching children's programmes, cartoons and films, they did not necessarily watch the same programmes. They might (at different times) prefer watching new programmes on television or re-watching for the 100th time, a favourite video or DVD. Their behaviour while watching also varied from total absorption (which might be interpreted as 'passive viewing') to high levels of interaction – or alternatively, they might be 'watching' a video in order to fall asleep. All of these behaviours have cultural implications, but each child demonstrates different combinations at any one time, and also over time, given that they are at an age at which socio-cultural development is very rapid, so that it is not possible to attribute their behaviour to socio-economic status.

It is perhaps easier to identify cultural differences between the two groups of parents. As we noted earlier, the groups of parents differ not only in terms of income, but also in terms of educational background and in terms of the kind of work they do. These differences may have implications for the cultural environments in which their children are growing up, but we do not have enough information to be able to comment on these.

Links to pre-school and primary school practice

To what extent are pre-school and primary school staff aware of children's home experiences with ICT, and how do they seek to build on these? In this section, we look first at the evidence from our linked study, *Interplay*, concerning children's experiences generally with ICT in pre-school settings,

and then at the ways in which links can be made between home and pre-school experiences. We then address the issues arising as children transfer from pre-school to primary school.

ICT in pre-school

Practitioners do not generally define ICT as broadly as in this study, tending to view it more narrowly in terms of computers and printers, even at sites where they use items such as digital cameras and tape recorders. Based on the *Interplay* settings and findings from our earlier study (Stephen and Plowman, 2003), one or more computers are present in all nurseries, although not always in working order. Both PCs and Macs are used, ranging in age from brand new to many years old. The computer is typically placed in the main activity room along with a range of other resources such as a water tray, nature table or book display. Children are offered daily opportunities to use a computer during free-play periods but scheduled practitioner-directed time at a computer is unusual. Most sites have access to the internet from the office but it is unusual for children to use the internet. All settings have access to television, video and audio equipment and digital cameras are becoming more widespread.

Among the pre-school practitioners interviewed for *Interplay*, the use of ICT resources was viewed as a normal and welcome part of the activities that they expected to provide in the playroom. Much of their concern was with the children's use of desktop computers but they also referred to children using audio tape players to listen to (though seldom to record) stories and music and, in some cases, to their use of digital cameras to record and recall playroom events. In the nurseries attended by the children involved in this study (as in most pre-school settings) computer play was an activity offered in free play but was not part of the learning experiences offered in the brief small-group, adult-directed times. Television and video were used sparingly, generally only when children remain beyond the normal two hours of the pre-school education sessions (if they stayed over lunch time or perhaps until 5pm, for example).

The practitioners recognised that most children were enthusiastic about the use of ICT, particularly the playroom computer, although they were aware of some children who were not attracted to the computer. This lack of attraction was ascribed to personal preferences in some cases, but also to individual children using a computer at home and choosing to be 'busy with other things in nursery'. Playroom staff expressed concern for the place of ICT in the balance of the curriculum experienced by each child, as they do for any curriculum area or activity. Reluctant computer users are encouraged to take part while others who want to spend long and frequent periods playing with the computer are invited to participate in other activities.

Children's developing technical competences (especially the use of the computer mouse) were commented on by practitioners. In addition, they mentioned developing social skills prompted by interactions around the computer, for instance, taking turns and working co-operatively. However, some practitioners were concerned that playing computer games could be a solitary activity that minimised the socialising contact with other children which they saw as fundamental to the purpose of nursery education.

Linking home and pre-school experiences

Practitioners talked about sharing any especially noteworthy technical competences that a child developed, or interest in computer use more generally, with parents and primary school practitioners through child's profile document. Any knowledge of children's ICT experiences at home was gathered informally during the induction period, the daily contact with parents and from conversations with children. Some, but not all, practitioners commented on the greater confidence demonstrated by children who use computers at home, arguing that these children were better able to operate the mouse and access and exit programs. Nevertheless, practitioners tended to consider home use of computers and electronic games to be qualitatively different from the computer play offered in nursery. Some expressed explicit concern over the length of time that children spend watching television or playing computer games at home and talked of offering advice to parents about restricting the time that children spend viewing or playing with ICT as well as recommending particular software or programs. Such teachers had qualms about the damaging social and cognitive effects of 'too much' ICT and 'the wrong sort' of ICT.

Transferring to primary school

The value of developing technical competences with ICT in pre-school before transferring to primary school was widely acknowledged by our respondents. They argued that, as children would have to be able to use a computer readily to succeed in the primary classroom, those who had acquired technical skills, ways of working co-operatively and confidence in using technology were advantaged as they started school. Indeed, some practitioners argued that this early experience was important for life, not just primary education.

Primary schools receive written information from children's pre-school settings and many are also able to learn about the children who are about to begin school through informal discussions with nursery practitioners and visits to pre-school provision. Despite all of these sources of information being available to the schools where we conducted interviews, there was an apparent low level of both interest in and awareness of, children's ICT experiences in pre-school. The transition records used typically pay little specific attention to ICT although they might note a child's special interest in using the computer much as they would an interest in construction or physical play. A low level of interest in or awareness of specific aspects of the pre-school curriculum among primary school staff is not uncommon (Stephen and Cope, 2003). Primary school teachers often refer to very basic life skills as all they expect from new entrants and to their preference for making their own judgements about children's competences.

When primary school teachers were aware of children being introduced to specific skills in nursery provision (for example, one nursery class was involved in an intervention targeted at use of tape players for stories) then they would expect children to have some technical competence that could be built on in school. All of the primary schools where we interviewed staff had a structured programme designed to extend children's ICT skills (very largely computer based) across the years of primary education in order to reach the attainment expectations set nationally.

There was one exception to the general lack of expectations about ICT competences and previous experience. One of the primary school teachers interviewed had some precise expectations: ability to use a television remote control to change channel; use a mobile phone; put on a tape to play a story (but not necessarily to rewind or fast forward); access a CD-ROM; play games on a mobile phone or games console if helped by adults or older siblings; be familiar with a PC (use of the mouse and CD-ROMs linked to curricular work); use a digital camera to take photographs; and interact with a *Roamer*. However, it was clear that, apart from using games with adults and siblings, all these expectations were based on a detailed knowledge of the children's experiences in the nursery class attached to the primary school.

In every case the primary school practitioners' knowledge of any computer or other ICT experience at home was anecdotal and usually the result of casual conversation with a parent or child. In many respects, their views coincided with the findings from this study.. For example, the were aware of the impact of economic factors:

> It is where parents don't have £1000 to splash out on a computer system at Christmas. … Where there is a little bit more money around, for parents [ICT] is a higher priority.

One teacher noted that many of the parents were single mothers and therefore 'they don't have that sort of thing', although some would like to have ICT resources. Others were aware of a divide in opportunities and experiences:

> In a predominantly professional sort of catchment area parents are often out working perhaps in professions and they use computers themselves and there is one at home or they are bringing a work place laptop home [so their] children are getting experience that not all children are.

Another respondent suggested that some 'poorer' homes did have computers but that they 'do different things with them'. However, we did not find evidence that teachers understood some of the more complex issues raised in this report: for example, that children from affluent homes with extensive ICT equipment might nevertheless have restricted access to this equipment because it was needed for work purposes, or seen as too fragile or sophisticated for young children to use; nor that

the 'different things' which children from less affluent homes might do with ICT could be culturally or educationally valuable.

At two of the schools, practitioners referred to ways in which they try to widen the opportunities that children have for access to a computer if they do not have one at home. One school ran an ICT club after school and ensured equitable access, although this was only available to the oldest children in the school. Elsewhere they adopted a more *ad hoc* approach, suggesting the use of library computers for project research for example.

Our school respondents shared a focus on school ICT experiences as opportunities to acquire technical, data handling and research skills. Although the use of email to friends was mentioned at one school, the communication function was not the dominant use of ICT, nor was the use of a computer to facilitate learning in particular curricular areas. One respondent described how new facilities would allow some straightforward teaching, such as how to set up a spreadsheet and how to navigate around a computer.

This focus on computer use for specific tasks that necessitate the acquisition of particular computer skills or competence with specified functions relates to the primary school respondents' perspectives on what they generally assume to be the most frequent encounters that children have with ICT outside educational settings – playing games. Although perhaps expressed more stridently than most, the perspective of one headteacher appears to represent a widely held view among educational practitioners:

> I wouldn't say they were learning computer skills, they are only playing games and pressing buttons and shooting people. ... They are not to my mind increasing their computer skills. ... I don't really count that. … *So the school [perspective] is about computer skills?* Yes, I would say so – for the work place.

Discussion

To what extent will children be able to make use of the ICT competences they have developed at home when they start primary school? The discussion in this chapter focuses on two issues:

- policy and practice in pre-school and the first years of primary school.
- potential for disadvantage to develop or become exacerbated.

ICT policy and practice in pre-school and the early years of primary school

Taking account of children's home experiences
As noted in the section on Policy, Scotland and England both recognise the need for pre-school practitioners to take account of children's home experiences with ICT. However, there is little discussion in either document of what these might consist of, or how practitioners might build on these experiences.

This study suggests that children's experiences are very varied. The extent of their interaction with ICT at home ranges from the limited (principally, television, video and music playing equipment) to opportunities to make use of a wide range of technologies with a variety of applications. But the activities in which children can engage differ considerably from one household to another. We noted in the previous section discussing the impact of cultural difference, that children in different families watch different television programmes and that they watch them in different ways. The same is also true, for example, of the computer games they play, and the manner in which they play them.

Our findings indicate that children acquire a range of cultural competences, including learning competences, through these and other kinds of interactions with ICT. However, we have also seen that pre-school and primary staff tend to have a limited or partial awareness of children's home experiences with ICT, and that they rarely consider their cultural or educational value. Inasmuch as these experiences were discussed at all, practitioners tended to express negative views, suggesting, for example, that children's television viewing should be limited, or that computer games have no

relevance to educational goals. Our study has not provided any examples of pre-school or primary practitioners exploring children's existing competences or setting out to build on these.

Supporting children's learning with ICT
In addition to making mention of the importance of taking account of children's home experiences with ICT, the Scottish and English policy documents imply a twin focus in children's developing competences, particularly as they begin school: learning about ICT (the uses of everyday technology, for example) and learning with ICT. As children move from pre-school to primary school, the emphasis in the documents appears to move from a wider to a narrower definition of ICT (where the main focus in schools is on computers) and, though the twin focus is retained, the emphasis appears to be on learning *with* ICT. In this regard, the English document identifies four attainment targets, and the Scottish document identifies seven strands, as illustrated in Table 2.

Table 2: ICT goals identified in English and Scottish policy documents

England Programme of Study for ICT: KS1	Scotland Information and Communication 5-14
1. developing ideas and making things happen	1. use of the technology
2. finding things out	2. creating and presenting ideas
3. exchanging and sharing information	3. collecting and analysing information
4. reviewing, modifying and evaluating work as it progresses	4. searching and researching
	5. communicating and collaborating with others
	6. controlling and modelling
	7. developing informed ideas about the use of ICT in society

The experiences with ICT at home described in our Findings section can be seen as relating to these goals in various ways. As an example, we consider here the competences children may have already developed in relation to information handling (point 2 of the English goals listed above; points 3 and 4 in the Scottish list) and the implications for schools.

We have seen that young children have some experiences of finding things out via ICT, but that this tends to be spoken and visual presentations of information (such as wild-life documentaries), because of the lack of literacy skills among children of this age. Nevertheless, it is likely that some children are developing more sophisticated skills in this regard, with the support of children's television presenters who encourage them to look out for information in the programme they are about to watch and then to answer questions subsequently, or to develop their ability to discover visual clues through programmes such as *Dora the Explorer*[1] which were popular with several of the children in our study. In addition, some children are becoming familiar with websites – usually those linked to their favourite television programmes, films or toys. In their exploration of these sites, children may be learning the conventions of such sites (clicking on highlighted sections, for example). Teachers could build on these skills if they were aware of them. In particular, the sophistication with which some children may approach visual material, as a result of their home experiences, raises interesting questions about the nature of the information sources to which they have access at school. Traditionally, children have learned search and research skills from books, and through training in 'library' skills, where literacy rather than 'visuality' tends to be privileged. As teachers move to incorporating CD-ROM or web-based material in project or other work designed to encourage children to develop research skills, to what extent do they encourage children to make full use of the multimedia resources, visual and aural as well as written? Does their practice enable children to develop these other research skills, in addition to those based on literacy?

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[1] This is an American programme in which children follow the adventures of Dora and help her to solve a series of puzzles to which visual and spoken clues are provided. Following maps is a key element in the programme. Some of the puzzles require children to learn Spanish words and phrases (as the characters are Hispanic Americans).

The other goals raise similar questions. In seeking to develop children's communication skills via ICT, do teachers take into account their existing skills with telephones (landline and mobile), webcams, or the ways in which their imaginative play around ICT items has developed communicative competence? Or, is it the case that teachers primarily understand communication via ICT to relate to email and the construction of websites (again privileging literacy over spoken and visual forms of communication)? In encouraging children to develop and present ideas or to work creatively, are they aware of their existing experiences of self-expression via still and video cameras, or of their ideas about how others create and present ideas via television programmes and computer games? We cannot answer these questions, partly because the teachers we interviewed did not identify such possibilities when we discussed ways in which they might build on children's home experiences, and partly because answers would require a more detailed focus on primary practice than has been possible in this study. But we suggest that further research into these possibilities is needed.

Potential for educational disadvantage

The key question we set out to address in this study is whether children with limited experiences of ICT at home are likely to be at a disadvantage when they start school.

In the short term, our findings suggest that the children who participated in our study are not likely to be particularly disadvantaged, principally because we have not found much evidence to suggest that primary schools take children's home experiences into account, or that these are greatly valued. Much of the focus of pre-school practitioners and primary teachers appears to be on the development of basic technical skills, such as the use of a mouse or computer function keys. All of the pre-schools in our study ensured that their children had acquired these skills, whether at home or through use of the pre-school computer, and therefore, in this very narrow sense, all the children will start primary school with the required minimum level of competence.

In the longer term, it seems likely that children's home experiences, now and in the future, will influence their interaction with ICT at school, but in ways which are difficult to identify. Much of the debate in this area has focused on the extent to which children can or do engage in 'school-like' activities at home, such as using computers to write essays, searching for information via the internet, or producing their own web pages. Given that all of these activities are dependent on literacy, our study of pre-school children could not address these issues. However, we have drawn attention to the very wide range of ICT-mediated activities in which they do engage, and have suggested that some of these activities could have relevance for the kinds of goals which policy-makers have identified for ICT at school, particularly if the multimedia potential of ICT were to be fully realised in school contexts.

Do some children have more 'valuable' experiences than others in this regard? Our findings indicate that some children have more opportunities than others to engage in a wide range of ICT-based activities and that (at least) five dimensions of these opportunities can be identified as:

- the range of equipment available to the child in the home or in the wider community
- children's interest in using this equipment
- models which family members or others in the community provide for use of the equipment
- family or other community members' knowledge and expertise in using the equipment
- family or other community members' support in enabling children to learn to use the equipment.

We can see that there are some links between socio-economic disadvantage and limitations on these opportunities. Children from families with little money may have fewer ICT items in the house, and these may be older and of poorer quality than those to which children in more affluent families have access. Similarly, children whose family or community members have little expertise in using the equipment themselves are likely to have fewer models of interaction with ICT. But these conditions do not always cluster together: for example, disadvantaged families may have limited or less up-to-date equipment, but family members may be enthusiastic users of the ICT at their disposal and provide a supportive environment for young children to begin to develop competences in this regard. Similarly more affluent families may possess very sophisticated and expensive equipment but forbid young

children to use it for fear of damage. We would argue that socio-economic disadvantage need not necessarily lead to educational disadvantage in relation to ICT, though it may be more likely to do so. This report has focused on socio-economic disadvantage primarily in terms of low income. We have not addressed other areas which also have a potential bearing on educational disadvantage, such as gender, ethnicity and disability. On these last two categories, we have no relevant data, as our case study families happened not to include children with disabilities or from minority ethnic backgrounds.[2]

Gender

In relation to gender, our data suggests some issues for further study in two areas. Firstly, they raise the question of whether certain ICT items are associated more with one gender than the other. Games consoles, for example, seemed to be bought for male family members, and to be of limited interest to girls or their mothers. In contrast, dance-mats were seen as more attractive to girls than to boys, although young boys were reportedly keen to play with these too, when given the opportunity. The educational implications of these divisions are not clear but would benefit from further exploration. Secondly, we found that the families in our study which were headed by lone mothers had the lowest levels of ICT equipment in the home. This may be simply because these families were also those on the lowest incomes of all. It may be, as we suggested earlier, that these families, for a variety of reasons, are more socially isolated than the others and therefore, in addition to having little money to spend on such equipment, do not have access to the kinds of networks which other low-income families had, which enabled them to swap equipment or find out about car boot sales and other opportunities for acquiring equipment at low cost. Or it may be that men rather than women are the principal purchasers of ICT equipment for family use, and therefore in families without adult or older males, such items are not seen as particularly attractive or useful.

Recommendations

In this final section, we make recommendations for further research, for the development of policy to reflect this and other work on children's home experiences of ICT, and for training for pre-school practitioners and primary staff to enable them to develop greater awareness of the nature of these experiences and the ways in which they can build on these in educational contexts.

Recommendations for research

A more substantial study of the issues explored in this work is required. For example, the limits of this study mean that we cannot say whether the experiences of children from disadvantaged families will translate into long-term educational disadvantage. This would require either a longitudinal study or a perhaps a study of siblings of different ages. A longer and more detailed study would also allow for a more in-depth investigation comparing the technical, cultural and learning competences which children are developing as a result of ICT-based activities at home, in pre-school, and in the early years of primary school. It would also allow for children's progression and attainment (globally and specifically in relation to ICT competences) to be measured over time, and for this to be correlated with home experiences.

Recommendations for policy

Policy documents in Scotland and England draw attention to the importance of children's home experiences with ICT, but, as there has been little research into this area to date, it has not been possible so far to be more specific about the nature of these experiences or the ways in which pre-school or primary staff might build on these. This study has identified a number of issues which policy-makers may wish to consider when further development of policy in this area is planned.

These issues include:

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[2] Our survey data indicated that two of the 204 respondents were of Pakistani origin, but neither of these families volunteered to take part in the case studies. We did not collect information relating to children with disabilities but consider that this could be a fruitful area for further research, particularly as there is some discussion in our case study data about the support which ICT provided for older children with disabilities in the families which participated.

- the range and diversity of children's early experiences, involving not only computers but also activity centres, musical keyboards, tape recorders, programmable and radio-controlled toys, remote control devices, telephones, televisions, still and video cameras
- the nature of children's existing ICT competences and how these can be mapped against the educational goals of ICT policy for pre-school and the early years of primary education
- the oral and visual focus of children's early experiences, in contrast to the implicit focus on literacy-based uses of ICT (largely computers) in classrooms
- the value of a more subject-specific focus to enable the wide range of children's home experiences to be drawn on effectively in areas such as music, drama or imaginative writing, in addition to the more obvious applications of ICT in supporting the development of literacy and numeracy skills, or in research for project work
- reflection on the increasingly important cultural role which ICT plays for children and their families.

Recommendations for pre-school and primary staff

This study found that pre-school and primary staff had limited knowledge of children's home experiences of ICT and were therefore not in a good position to make use of the competences they were developing at home in pre-school or primary practice. This suggests a need for training which addresses these issues, including a focus on:

- what children are learning to do with ICT at home or in the community
- how they are learning to do this
- the potential educational value of both process and content
- how best to make use of the competences children already possess, and how these might be developed at school, or in tandem, at school and at home.

If nurseries and primary schools become more successful in building on existing competences than currently appears to be the case, practitioners will also need to consider who is disadvantaged in this context, and how best to support children who have had, and may continue to have, limited experience of ICT outside school.

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Appendix A: Details of participating nurseries

Nursery Class A is a local authority nursery class offering part-time sessional pre-school education (for 3-5 year olds) during term time. It is situated in a primary school that serves a prosperous area with an unemployment rate below the national and local averages.

Nursery B and Out of School Care offers sessional pre-school education for children aged 3-5 years as well as caring for children from birth to three and for some 3-5 year olds beyond their sessional hours. The centre is open from 8 am – 6pm for 51 weeks each year. It serves an area of high unemployment (about a third above the local authority average) with over a third of the houses in the lowest council tax band. Children make up one quarter of the population of this ex-mining village.

Nursery School C is a local authority nursery school for children aged 3-5 years. Most children attend for pre-school education sessions only but a limited number of children stay for all or most of the day. There is provision for some children to arrive before and leave up to one hour later than the sessional hours. The area has a mix of local authority and private housing and an unemployment rate equivalent to the national average.

Nursery D is a private nursery offering care and education for children from birth to five years old. It is open for extended hours throughout the year but children may attend for pre-school education sessions only. The nursery is located in a rural area between two towns but near to a major motorway junction giving access to popular commuter routes.

Nursery Class E is located in the shared grounds of two primary schools (one denominational). It offers sessional pre-school education for 3-5 year olds during term time. It is located in an isolated village with an unemployment rate above the national and local average and over half of the houses falling into the lowest council tax band.

Nursery Class F is part of a newly constructed primary school. Children attend for part-time pre-school education sessions during term time only. It is a situated in a relatively affluent area with an unemployment rate below the national and local averages where the majority of houses fall into the mid-range of council tax bands.

Nursery Class G is situated in a primary school and alongside wrap-around care provision. The nursery class offers part-time sessional pre-school education during term time but about half of the children attending use the wrap-around service before or after their time in the playroom. The area around the nursery class has very low levels of unemployment and the proportion of houses in the lowest council tax band is well below the local authority average.

Early Years Centre H offers part-time, sessional pre-school education and a wrap-around service for children aged 3-5. The centre is open for extended hours throughout the year. It is situated in a relatively deprived area with unemployment rates above the local and national averages. Almost one quarter of the housing falls into the lowest council tax band and the proportion of children in the area is above the national average.

Appendix B: Family Questionnaire

CHILDREN & ICT AT HOME

Thank you for agreeing to take part in this survey on children's use of ICT (Information & Communication Technology) at home. First we would like to ask you a few questions about your child.

1. When was your child born?   Day……………Month……………Year……………

2. Is your child a boy or a girl?   Boy   Girl

3. How are you related to your child?   Mother   Father

Other ……………………………………….
Who? Please state relationship with child.

4. What is your home postcode?   …………………………………………………

Now we would like to find out more about the sorts of things your child likes doing at home.

5. Which of the following activities does your child do at home? Who does your child usually do these with? **_Please tick one box only for each activity._**

Please tick one box only for each row. M.	My child …			
	… usually does this alone	… usually does this with sister(s)/ brother(s)/ friend(s)	… usually does this with an adult	… rarely or never does this
Role play (e.g. vets, nurses)				
Outdoor games and activities				
Construction games (e.g. Lego, Duplo)				
Jigsaws, board or card games				
Books, comics				
Helping around the house				
Drawing/writing				
Plays or looks after family pet				
Musical activities				
Cars, trains, model farms or zoos				
Soft toys, teddies, dolls				
Other. *Please say what:* 1……………………………………………				
2……………………………………………				

Our next questions ask about your child's experiences of ICT at home – TV, mobile phones, computers, cameras, etc.

6. How many of the following items does your family own?
 Please <u>write a number</u> for each item, or put 0 for none.

TV		Digital camera	
Video		Video camera	
DVD player		Game console (PlayStation/GameCube etc.)	
CD/tape player		Handheld electronic games (Game Boy)	
Mobile phone		Robot toys, smart dolls etc.	
Non-digital camera		Musical keyboard	

7. Which of these items does your child use? Who does your child usually use them with?
 Please tick <u>one box only</u> for each activity.

Please tick <u>one box only</u> for each row. N. O.	My child … … usually uses it alone	… usually uses it alone, but needs help from time to time	… usually uses it with sister(s)/ brother(s)/ friend(s)	… usually uses it with an adult	… rarely or never uses it
TV					
Video					
DVD player					
CD/tape player					
Mobile phone to make calls					
Non-digital camera					
Digital camera					
Video camera					
Game console (PlayStation/ GameCube etc.)					
Handheld electronic games (Game Boy, on mobile phone)					
Robot toys, smart dolls, etc.					
Musical keyboard					

Now we would like to ask a few questions about your family's use of computers.

8. Do you have a computer at home? Yes   *Please answer the questions below.*
                          No   *Please go to question 13.*

9. How many computers do you have*? Write the number here:* ………………………………

10. Does your child use a computer at home?   Yes   *Please answer the questions below.*
                          No   *Please go to question 13.*

11. How often does your child use the computer at home?
    Every day   Several times a week   About once a week
    About once a month   Less than once a month

12. What sorts of activities does your child do on the computer? Who does your child do them with?
               Please tick one box for each activity.

Please tick one box only for each row. Q. R.	P. My child …				
	… usually does this alone	… usually does it alone, but needs help from time to time	… usually does this with sister(s)/ brother(s)/ friend(s)	… usually does this with an adult	… rarely or never does this
Plays computer games					
Watches DVDs or videos					
Uses drawing software					
Uses writing software					
Uses other learning software					
Visits websites					
Sends and receives email messages					
Looks at digital photos					
Other. *Please say what:* 1…………………………………					
2 …………………………………...					

13. Does your family have access to the internet?

      No   *Please go to question 14.*

   Yes   *Please say where by ticking <u>one or more boxes</u> below:*

   at home

   at the home of a friend, relative or neighbour

   at a library or internet café

   elsewhere
   Please say where: …………………………………………………

People have different views about the way ICT, such as TVs, computers, video games, mobile phones, etc., influence our lives and the lives of our children. We are interested in knowing your views.

14. Other people have said the following things about ICT. Do you agree?
Please tick <u>one box only</u> for each statement.

Please tick <u>one box only</u> for each row.	**Strongly agree**	*Agree*	**Don't know**	**Disagree**	**Strongly disagree**
ICT will make our children's lives easier.					
ICT damages family life and relationships.					
ICT gives children more things to talk about and do with their friends.					
ICT is damaging to children's health and development.					
Our children will need to know about ICT for school.					
Our children will need to know about ICT for work.					
Playing with ICT helps children learn.					
Parents should help children learn to use ICT.					
Parents should control the amount of time children spend with ICT.					
Children are better than adults at learning how to use ICT.					

15. Do you have any other comments about children and ICT?

Please use the space below to give us your views.

Finally, we have some general questions about you and your family.

16. How many adults (people aged 18 or over) and children (people aged 17 or under) live in your house? *Please fill in the underlined numbers in the spaces below.*

…………… adults   …………… children

17. What is the relationship of the adults <u>living in your house</u> to the child?
For example: mother, grandfather, brother, step-mother, lodger, family friend, etc.

	Adult 1 (you)	Adult 2	Adult 3	Adult 4
-Relationship to child				

18. Which language(s) do you or any of the other adults <u>living in your house</u> usually use with your child?

Language(s) usually spoken with child	Adult 1 (you)	Adult 2	Adult 3	Adult 4
S. T. **English**				
Other. *Please state language:*				
Other. *Please state language:*				

19. What is the highest education qualification of each of these adults?

For example: O-Grades / Standard Grade, Highers, SVQs, HND, degree, professional qualifications, none, etc.

	Adult 1 (you)	Adult 2	Adult 3	Adult 4
Highest educational qualification				

20. What is the work situation for each of these adults?
Please tick the box which best fits the situation in each case.

Please tick one box only for each adult. **U.**	Adult 1 (you)	Adult 2	Adult 3	Adult 4
Self employed				
Employed full-time				
Employed part-time				
Looking after home/ family				
Permanently retired from work				
Unemployed and seeking work				
Full-time education (further/ higher)				
Government work or training scheme				
Permanently sick or disabled				
Short-term sickness or injury				
Other				

21. What is the total annual income for your household, including wages and benefits, but <u>after</u> tax and national insurance? *Even if you don't know the exact figure, please tick the box that you think is closest to your household situation.*

Please tick <u>one box only.</u> **HOUSEHOLD INCOME**	
£6,000 or less per year	
£6,001 - £10,000 per year	
£10,001 - £15,000 per year	
£15,001 - £20,000 per year	
Over £20,000 per year	
Don't know	

We are looking for some families who would be willing to answer more questions about children's use of ICT at home, and are offering a £20 voucher for those who take part. If you are interested, please leave your telephone number below.

Phone number: …………………………………

Thank you for taking the time to complete the survey.

Please return this form to your child's nursery by
<u>**Monday, 10th November 2003**</u>