Parents, pre-schoolers and learning with technology at home: some implications for policy

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Parents, preschoolers, and learning with technology at home: some implications for policy

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Abstract
Schemes which seek to ensure that children have access to technology at home have, so far, been aimed at children over the age of eight. However, there is likely to be increasing policy interest in extending similar schemes to preschool children given widespread commitment to the value of early intervention in children's education and family life. We draw on three research studies conducted by the authors to discuss the range of technologies children encounter in the home, the different forms their learning takes, and family support for learning. We use these findings to provide starting points for considering the implementation of similar schemes for preschool children and their parents in the future, identifying several questions to consider when developing policy on home access to technology for preschoolers: Which technologies are most appropriate? Will access to technology in the home lead to increased use? What roles do parents play in supporting learning? Which forms of learning are most likely to be promoted?

Key words
early years, preschool, parents, home, policy, ICT

Early intervention and progress through technology

Successive governments have invested in computers and internet access for pupils, both at school and, more recently, at home. Underlying their actions is the belief that such investments will pay off in the future because the use of technology will lead to educational attainment, and this will lead to employment, earning power and economic activity. Political attention has so far mainly focused on children over the age of eight or nine, but in this paper we consider the role of technology in the pursuit of these objectives for preschool children.

We start by considering a policy landscape in which governments' commitment to the value of early intervention in children's education and family life is matched by a conviction that technological know-how will contribute to later employment and economic competitiveness. These policies lead us to believe that the attention which has hitherto been centred on access to technology for school-aged children will be extended to young children. Accordingly, we draw on three research studies of three- and four-year-old children playing and learning with technology at home to identify some issues for consideration when formulating policy in this area.

In response to a desire to prepare children of all ages for what is seen as an increasingly complex and digital world, there have been signs that introducing children of this age to ICT (information and communication technology) is inevitable. The UK government's interest in the link between education and ICT has moved down the age range from children in the compulsory years of schooling (roughly from age five to 16 in the UK) to preschool children (typically ages three and four). Computers in particular are seen as a tool for getting children ready for school and even employment. The *Ready to Learn* initiative in the USA (Penuel, Pasnik, Bates et al 2009), for instance, was explicitly aimed at preparing low-income children for school by exposing them to a technology-supported curriculum.

The preschool curriculum now encompasses ICT in many countries of the developed world[i], but while the home as a learning environment for older children has been an area of increasing interest (Grant 2010), its potential as a site of learning about and with technologies for preschool children has not received a similar level of attention. This absence is partly the result of public concern about the role of technology in the lives of young children (Byron 2008; Plowman, McPake & Stephen 2010) and partly because the needs of older children, who will enter employment imminently, are more pressing.

The *Computers for Pupils* scheme (2006 to 2008), for instance, distributed funding of more than £60 million for pupils aged 11 to 16 in the most deprived areas of England, mainly focusing on the use of computers for homework and providing course materials online (Lynch, Bielby, Judkins, Rudd & Benton 2010). In 2008 the English government committed £300 million to the *Home Access* programme, which funded computers and internet access for pupils aged eight to 19 in disadvantaged families (Becta 2009), although the change of government in May 2010 led to the suspension of funding.[ii] Neither of these initiatives was aimed at preschool children, although it is clear that governments are firmly committed to the financial value of early intervention in other aspects of early childhood education. Early intervention is predicated on a belief that the pattern for success in later life is established in the preschool years and that partnerships between services, families and children are the way forward, both in England (DCSF 2007, 2009) and in Scotland, through programmes such as *Getting it Right for Every Child* (Scottish Government 2008a) which aim to support a shift in culture, systems and practice for children and families. The *Early Years Framework* (Scottish Government 2008b, p.7) refers to the first years of a child's life as laying the foundations of skills for learning, life and work and as having a major bearing on wider outcomes including employment, a position summarized on the associated website as 'positive start, positive outcomes'.

Research that shows that the quality of early years education can protect against the transmission of disadvantage across generations (Feinstein, Duckworth & Sabates 2008; Sylva, Melhuish, Sammons, Siraj-Blatchford & Taggart 2010) is now widely accepted by policy makers. The Education Secretary in Scotland, for instance, claimed that every pound invested in early years provision ultimately saves the taxpayer £7 by reducing costs associated with ill health, low educational attainment and crime in later life (Scottish Government 2010a; see also Scottish Government 2010b). This investment in early years provision is targeted primarily at children's education and eventual employability. The *Curriculum for Excellence* (Learning and Teaching Scotland 2009), a single curriculum framework which spans learners from three to 18, specifies the need to develop expertise with technologies and links this explicitly to the skills needed for employment:

> Being skilled in using ICT is essential if children and young people are to be effective contributors, and to communicate and interact on a global scale... It is essential that all [practitioners] have opportunities to apply, reinforce and extend ICT skills within and across curriculum areas to help equip children and young people with the learning and employability skills required for the 21st century.

Extending Opportunity, the report of the taskforce on home access to technology, started with the assertion that 'strong evidence exists for the potential educational, economic and wider benefits of home access to technology' (Becta 2008a p.6). It is likely to be only a matter of time, then, before a similar scheme is rolled out to households including a preschool child, thereby yoking the discourse of early intervention with that of progress through technology.

Within this discourse, progress takes two main forms, with computers and internet access central to both: pupils' attainment and, connected to this, the development of skills for the workforce of the future. The *National Educational Technology Plan* (US Department of Education 2010) describes learning as 'powered' by technology, referring on its first page to the 'rapidly changing demands of our global economy'. The *Digital Britain* interim report states that 'in education and training for digital life skills, we need a step change in approach, starting with the youngest' (BERR/DCMS 2009 p.64) and similar aspirations are found in the *No Child Left Behind* legislation introduced by the United States (U.S. Department of Education 2002). The final *Digital Britain* report states that 'The ability of Digital

Britain to contribute its full potential to our future economic growth is critically dependent on having enough people with the right *skills* in the right place at the right time to develop and apply the new technologies' (original emphasis). This depends on 'a healthy pipeline of talent into the professional digital workforce' which 'starts in the education system' (DCMS/BIS 2009 p.21). For now, this 'pipeline', starts during the years of compulsory schooling; the explicit belief in the power of computers to drive up standards through individual attainment, as promoted in *No Child Left Behind* or *Extending Opportunity*, is beginning to emerge for the early years (cf *Ready to Learn*) but does not yet have the prominence it has had in schools for many years.

To date, most ICT projects aimed at forging links between home and preschool have been small scale, typically organized within an education authority or initiated by enthusiastic individuals, and consist of schemes in which parents can borrow laptops from a nursery or use digital cameras to document learning across sites. Indeed, with some exceptions (Marsh 2010; Rideout & Hamel 2006) there has been very little research that reports young children's play and learning with computers and other technologies at home, and the emphasis continues to be on preschool settings (Aubrey & Dahl 2008; Parette, Quesenberry & Blum 2010).

The focus of this special issue of JCAL is on putting policy into practice in the home but, as outlined above, initiatives such as the *Home Access* scheme have not yet extended their reach to include children of preschool age. Our purpose here, then, is not to describe or evaluate the implementation of existing policy but to respond to the question 'What do we know about young children's learning with technology in the home?' and to consider how this can provide insights which may inform future policy. In this case, we are using the shifts in policy outlined above to prompt thinking about our research on existing practices in the home in terms of what it might mean for the future. We use Britto, Cerezo and Ogbunugafor's (2008 p.104) definition of policy relating to early childhood:

> a plan or course of action, supported by a publicly funded institution (eg government) that has an impact on the lives of young children... The plan or course of action is a deliberate strategy with actionable activities that key stakeholders and sectors should undertake to most effectively use resources to achieve the desired [early childhood] policy goals. The policy provides an umbrella to ensure that all program activities and projects are supported by the highest national legislative, policy and decision making bodies and at more decentralized levels of government...

There has been a clear expansion of the state's sphere of interest from formal education settings to the home and an associated focus on parental engagement, in spite of its proclamation that 'government does not bring up children – parents do' (DCSF 2009 p.9). The following sections therefore summarize a sequence of studies conducted over the last decade that focus on different aspects of the role of technology in the everyday lives of children and their associated learning. We then consider some issues to take into account when formulating policy for the planning and implementation of similar schemes for preschool children and their parents in the future.

Three studies of children and technology at home

It is by no means a novel observation that families have a key role in supporting children's learning. The Hadow Report (Consultative Committee on the Primary School 1931) recognized that children acquire 'almost as much general knowledge in the home as... in the school, and... almost as much information about the world and its way during leisure hours... as from the formal lessons in the classroom'. Published during the 1960s, the influential Plowden Report (Central Advisory Council for Education (England) 1967) has a section on the importance of parental attitudes and the 'physical amenities' of the home, but in spite of this long history of acknowledging the importance of the home and family life in the education of young children, it has not translated into Britto et al's 'deliberate strategy with actionable activities', with some exceptions in areas such as literacy and numeracy.

This discussion draws on three research studies which explore the home experiences of young children playing and learning with technology. Across these three studies, we have worked closely with 54 families who were selected to ensure a balanced distribution of gender of the target child and family socioeconomic status. (See Table 1 for a summary of these studies and Appendix 1 for further

information.) While these studies are relatively small in scale, the multiple rounds of data collection have enabled us to glimpse into many aspects of family lives. The emphasis of the three studies varied, but they all considered the range of technologies available to children at home and identified both the opportunities for learning afforded by these resources and how families support this learning.

The first study (2003-2004), *Already at a disadvantage? ICT in the home and children's preparation for primary school*, investigated the impact of socioeconomic status on preschool children's learning with technology in the year before they began formal education. The second study (2005-2007), *Entering e-Society: Young children's development of e-literacy*, focused more specifically on the competences needed to make effective and creative use of digital technologies. In broad terms, these two studies found that most young children had many opportunities to experience a wide range of technologies (McPake & Plowman 2010; Stephen, McPake & Plowman 2010). As a result, by the time they were ready to start school most children had established early digital literacy and used this to support the development of early print literacy, as well as number, information-gathering and problem-solving skills.

The third study (2008-2011), *Young children learning with toys and technology at home* (the main focus of our discussion, referred to here as *Toys and Technology*) traced children's play experiences at home over the course of eighteen months. Its aim was to use household case studies to produce an account of children's interactions with the full range of domestic, leisure and work or study technologies at home, including technological toys.

Table 1 about here

An ecocultural approach to research in the home

As our research moved from preschool settings to family homes it became obvious that the environment itself is an agent in shaping learning interactions (McPake 2010; Plowman, Stephen & McPake 2010). The three studies are therefore linked by an ecocultural approach (Tudge 2008) that illuminates the interactions between people, places and things, and how they interweave with the values and practices which permeate family life and everyday activities. Multiple visits to family households enabled us to develop relationships of trust, build detailed portraits of their lives, elicit children's perspectives, gain an understanding of family cultures, and track changing patterns of use and attitudes. This multi-faceted approach involved documenting an ecological framework of children in their natural settings which included accounts of children's perspectives (Stephen, McPake, Plowman & Berch-Heyman 2008), tours of the homes which were conducted by the children (Stevenson & Adey 2010), the use of mobile phone diaries (Plowman 2010), videos of day-to-day life recorded by the families, and audits of the toys and technologies found at home. This approach highlighted the relationships between families and the contexts in which they live, showing how children's experiences with technology are shaped by the ways in which opportunities are made or limited (for instance, by regulation of time made available for watching the television or using the computer), space is made available (for instance, the location of resources in the home) and toys and technologies are provided as resources for play and learning. These features are, in turn, shaped to some extent by socioeconomic status and children's own preferences as well as parents' previous experiences with technology and beliefs about its educational potential.

We conceptualize the learning environment of the home both as a technological landscape and as a setting in which cultural values are modelled and transmitted through family relationships. By combining these ways of looking at children's everyday lives we can develop our understanding of their experiences with technology and how the attitudes and aspirations of their parents and others can shape the nature and focus of their interactions. This approach enables us to reveal the elements of their lives (technologies in the home, opportunities for learning with technology, and family support for learning) in which we are most interested for the purposes of informing a debate on home access to technology for young children. These categories are therefore used to structure the following sections, which provide highly condensed accounts of the main findings arising from these studies.

We cannot make direct comparisons between the families involved in the *Home Access* scheme and

participants in *Toys and Technology* because we used different criteria for assessing socioeconomic status (SES) and our sample is very small, although the distribution of families is in line with the Scottish Household Survey (Hope & MacDonald 2007). The families we recruited were assessed in terms of two bands of high and low SES (with seven families in each) as measured by the parents' employment and education. It is likely that, of these, only two or three families would have met the eligibility criteria for *Home Access* if it had been extended to households with a preschool child in the same period.

Technologies in the home

The different approaches to conceptualizing technology at home and in formal education settings are demonstrated by the language used. 'ICT' is used to describe the information and communication technologies available in preschool and school, a term that derives from policy and is strongly associated with educational uses of computers and interactive whiteboards. Parents do not use this term, and so we refer to 'technologies' in the home environment as it suggests a much broader range of products which are associated as much with leisure as with other domestic activities. These different types of technology give rise to different practices, values and interactions, referred to by Selwyn, Potter and Cranmer (2009) as a digital 'disconnect' across schools and homes.

All fourteen of the families involved in *Toys and Technology* owned computers, although two families in the lower socioeconomic band acquired theirs in the course of the study. The family with the highest number of computers (four in a three-person household) was in the low SES group; three families had three computers and, overall, there was no correlation with SES. All of the families had broadband access by the time we finished our visits in October 2009. Similarly, there was no correlation for ownership of televisions, with ten families having three or more televisions, and no clear patterns in ownership of video or still cameras, MP3 players, mobile phones or DVD players. Multiple video or handheld games consoles were also common across households, although the three families who did not own a Nintendo Wii were in the low SES band. By the time they were ready to start school, our case-study children had encountered a range of leisure technologies, such as television and DVD players, electronic musical instruments, games consoles, iPods and CD players and owned or shared toys that simulate mobile phones, laptops and cash registers. Digital and mobile phone cameras were important for communicating with other family members, and children enjoyed games on computers, websites such as *CBeebies* and *Nick Jr.*, games consoles, handheld devices and mobile phones.

We generally describe children as encountering rather than using technologies in the home because family ownership did not necessarily lead to use by the children. Some high cost items, including computers and mobile phones, had limited availability for preschoolers because parents were concerned that they might get damaged, although technological complexity also affected children's use of some products. Across all three studies, almost all of the children had learned to switch on the television and could select channels, and they were learning to use DVD players, which entailed choosing and inserting discs and recognizing different icons for controls. Some could use onscreen menus to select programmes stored on hard disc, to check television schedules or to play interactive games. Parents usually encouraged this growing autonomy as it freed them from the need to change channels or insert DVDs on demand. However, mobile phones and computers were not as frequently used on a solo basis: children needed to understand how to send a text, play a game, or view photographs and most children of this age had limited competences for reading the written word. Large-screen and handheld games consoles could also represent a challenge for small children, as gameplay can require fine motor control and quick thinking. Children often found these games attractive but frustrating, although many could overcome these hurdles with the assistance of siblings.

All the families in our case studies had some characteristics in common – a three- or four-year-old child attending nursery and living in central Scotland - but there was wide variety in attitudes to the role of technology in their child's education. Some parents, across income levels, were enthusiastic users of leisure and work technologies and saw children's developing competences with technology as necessary for a successful future. These parents would feel comfortable with the rhetoric of progress through technology outlined earlier. In other homes, more traditional activities were highly valued and parents encouraged imaginative games with dolls or outdoor play. Some of these parents

expressed the view that they were not hostile to technologies but they were in no hurry to encourage their child to spend time at the computer: there would be time enough once they were at school.

Based on the families in all three studies, there was no clear divide in attitudes between those who were financially advantaged or disadvantaged or even, in many cases, between those families who had high levels of technology at home and those who did not. Advantaged families were more likely to have expensive and up-to-date technological items, particularly if they were needed for working from home, but this did not mean that children in these families necessarily had greater access to them (McPake & Plowman 2010). Children in low SES families typically lived in homes with similar levels of technology to children in high SES families, though the items might be older or have been acquired second hand. These parents were sometimes more relaxed about children playing with technology at home precisely because it was less valuable and less sophisticated than was the case in some of the high-income households. Explaining young children's access to, and use of, technology in terms of socioeconomic status is therefore a complex matter.

Opportunities for learning with technology

Our understanding of learning with and about technology has moved beyond a competence-based approach which focuses on operational skills towards an expanded account which includes knowledge and understanding of the world (encompassing traditional understandings of numeracy and literacy), learning dispositions, and cultural awareness of the roles which technology plays in family life, work and play. While it is clear that knowing how to operate and control technologies is important, the technologies we found in the home have the potential to support early learning in diverse ways.

Our analysis of support for learning in the home is grounded in an ecocultural approach that recognizes that a child's learning cannot be separated from the environment in which it takes place and that these factors interact with people and the technological resources at hand. Within this framework, learning at home is a co-constructed outcome of the activities and cultural practices that children engage in with others and consists of the intergenerational, informal practices that suffuse family activities. Our observations showed that there are a range of people at home who may help, or hinder, access - parents, siblings, other relatives such as grandparents and cousins, and, less frequently in this age range, friends. There are many opportunities for children to interact with or observe family members, creating a link between family culture and children's learning. This is a much richer form of learning than implied by policy terms such as 'family learning' or 'parental engagement' which generally refer to the involvement of parents in their children's numeracy and literacy activities, reading with children at home, encouraging homework (Desforges & Abouchaar 2003) and communication between school and family (Becta 2008b).

Family support for learning

All three studies showed how parents orchestrated learning through the provision of resources, by setting up activities, overseeing safety and ensuring that children were not getting stuck, whether they saw their actions in these terms or not (Plowman, McPake & Stephen 2008). Parents believed that they were not directly involved in supporting their child's learning because they rarely used explicit tutoring but our analysis showed that the ways in which children's learning with technology was supported at home were not necessarily visible and that parents frequently underestimated their role. By providing an example to follow or to imitate, modelling was a central aspect of support for learning. In the home, authentic activities were commonplace and children learned from observing family members and by joining in themselves about the ways in which we use technologies to communicate with others, to shop online, for leisure activities, or for work and study.

Although we concluded that SES was not the most important factor influencing young children's encounters with technologies, our earlier research clearly demonstrated that some children were more technically competent and more aware of the range of potential uses of different technologies than others by the time they started school. *Entering e-Society* considered what might account for these differences if SES was not the most obvious explanation and concluded that the role of parents' values and attitudes was a key factor in enabling or constraining opportunities for learning with technology. Family practices were mediated by parents' beliefs about young children and technology, usually based on parents' earlier experiences of technology at school or work, their own expertise,

and their views on the importance of digital skills in the future. Their perspectives on the potential benefits or dangers of early exposure to technologies were a powerful influence on the extent of the opportunities provided for their young children to explore or play with different technologies.

Discussion: future directions for home access

As indicated in the introduction, there are currently no initiatives similar in scale to the *Home Access* programme which aim to provide preschool children and their families with computers and internet access at home, but government interest in the economic value of early intervention in a child's education suggests that a version of the scheme may be introduced in the foreseeable future. In terms of possible expanded schemes, one question to consider is 'access to what?' The recent scheme was concerned with providing computers and internet access through mobile broadband. While this may be appropriate for children during the years of compulsory schooling, it could be too limited in terms of suitability for preschoolers' learning. In the same way that we found that a focus on computers to the exclusion of other forms of technology in preschools led to a restricted view of learning, there is a danger that a government-sponsored scheme which privileged computers in the home might also reinforce a view of learning as being predominantly about developing operational competence. Our research in preschools (Plowman & Stephen 2005, 2007) showed that the dominance of computers meant that children frequently struggled, sometimes due to operational problems, sometimes due to lack of guidance, although activities were described as 'playing' with the computer. A focus on computers and the internet as part of a home access scheme for preschool children risks reproducing some of the same problems we saw in preschools.

The emphasis on procurement and implementation in schemes such as *Computers for Pupils* and *Home Access* are based on an assumption of causality: that access to technology leads to use, and that use leads to learning. Our research shows that family ownership of computers is not the key criterion for use by young children: this depends on a complex mix of parental attitudes, the educational aspirations they have for their children, and how much supervision is required and offered. While it might be expected that children in households that had been categorized as having a high level of technology would have a wider range of competences than children in low technology households we found no clear relationship. A high level of presence in the home did not necessarily mean technologies were made available to the children and, where they were, it did not necessarily mean that children were drawn to use these resources, even when encouraged by their families. Ownership did not therefore correlate with access, indicating that income is not the only factor to take into consideration when investigating digital disadvantage. Internet access is widely regarded as the key marker of the digital divide for adults but it was less important than some other factors for preschool children because a relatively small proportion of their activities required it. Although children's websites were popular, watching television or DVDs, playing games on consoles, and play with other types of electronic toys were more prevalent in these three studies.

Learning

The prospect of a 'pipeline of talent' for a digital workforce which starts in the preschool years is a plausible development of policy, but one which is at odds with the ethos of early years education with its focus on active, experimental learning and learning through play. The framing of such a scheme would need to address how these different purposes of education can be reconciled and to recognize that policymakers, parents and children would have different answers to a question such as 'What are the desired outcomes of supporting children's learning through technology at home?'

A starting point for considering this question is to clarify what is meant by 'learning'. *Extending Opportunity* (Becta 2008a p.10) states the case for home access in terms of educational outcomes for the learner, specified as: impact on attainment, impact on the development of both ICT and general learning skills, impact on motivation and engagement, an increase in self-directed learning, and increased continuity of learning between home and school. Based on our discussion of the ways in which young children's learning with technologies is currently supported by families at home and the curriculum guidance for education in the early years, these may not prove to be appropriate goals.

Our research on what children have learned as a result of these early home experiences with technology shows that, by the time they are ready to start school, children have developed learning

with technology in the areas of acquiring operational competences (how to use computers, televisions, DVD players, mobile phones and games consoles), extending knowledge about and awareness of the world (learning via the medium of technology), developing dispositions to learn (such as persistence, engagement and confidence) and learning about the role of technologies in everyday life and how they can be used to maintain family relationships and communication. Of these, the first (learning how to switch equipment on and off, record, store, retrieve, select) is perhaps the least significant inasmuch as its acquisition is a fairly straightforward matter. Nevertheless, it is this learning that schools and preschools privilege. If learning is mentioned at all, it is often operational competences that are referred to in discussions about children and ICT, and the most likely to be promoted if the emphasis is on computers and digital skills. The evaluation of the *Computers for Pupils* initiative (Lynch et al. 2010 p.65) reports, for instance, that 80% of learners 'thought that having access to their own computer had helped them to be better at using computers'. Teachers reported use of software packages leading to better presentation of work and more topic-based research using the internet but, while desirable, these are not priorities for learning in the early years. Children may not have been able to operate some of the technologies they saw in use at home, but they had an awareness of their function because the activities were culturally embedded in family members' day-to-day lives. Even in low technology households, the home provided a much richer mix of technologies than many preschool settings as well as providing opportunities for children to both observe and participate in authentic activities.

Conclusions

Perry, Amadeo, Fletcher and Walker (2010) consider a number of possible drivers for educational policy in the UK, including ideology, personal experience, a sense that 'something must be done', electoral popularity and pressure groups. Evidence from educational research is last on the list. They describe the ways in which belief in the power of the market, and conviction that choice and competition will lead to lower costs and higher standards, have much greater weight in shaping policy than educational research. Nevertheless, our research suggests several questions to consider when developing policy on home access to technology for preschoolers: Which technologies are most appropriate? Will making technology available in the home lead to increased use? What roles do parents play in supporting learning? Which forms of learning are most likely to be promoted?

The likelihood of tension between the skills agenda of home access schemes and the aspirations of early years curricula suggests that a full consideration of the forms of learning to be nurtured would be a good starting point for future initiatives. The early level of the Curriculum for Excellence in Scotland (Scottish Executive 2007) and the Early Years Foundation Stage in England (DCSF 2008) emphasize the importance of supporting children in all aspects of their emotional, social, cognitive and physical development in ways that will enable them to become increasingly independent, responsible and eager to progress in their learning. The desired outcomes are confident, capable and self-assured children who are skillful communicators and who enjoy loving and secure relationships and enabling environments. These aspirations are compatible with the examples of playing and learning with technology at home that we have observed and described elsewhere but the introduction of a *Home Access*-type scheme would need to be sensitive to these dimensions of learning at home and to the risk of disturbing the home's delicately balanced ecology of inhabitants, learning opportunities, and resources.

[i] For summaries of preschool curricula beyond the UK and the USA see Pramling Samuelsson, Sheridan and Williams (2006) and Stephen (2006). A recent special issue on early years education in Nordic countries does not mention ICT, although the editor (Parker-Rees 2010) refers to the trend towards 'schoolification' and the shift in emphasis from the 'holistic development' of young children towards a narrow concern with preparation for school.

[ii] A Becta announcement on its website, dated December 2010, claimed that more than 250,000 families had been involved. The scheme, described as a 'runaway success', had now closed, following the government announcement in May 2010 of the planned closure of Becta. Although this signals a change in the English government's policy on ICT and education it is our belief that the commentary and analysis provided in this paper remain valid because this shift is likely to be temporary; the overall direction across the developed world is

towards children's greater access to technology at increasingly earlier stages of their development for the reasons we outline here.

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Table 1. A summary of three research projects

Name of research project	**Already at a disadvantage? ICT in the home and children's preparation for primary school**	**Entering e-society: Young children's development of e-literacy**	**Young children learning with toys and technology at home**
Funder	Becta	ESRC	ESRC
Dates of study	2003-2004	2005-2007	2008-2011
Duration	9 months	18 months	36 months
Characteristics of case-study families	16 families (8 'more' and 8 'less' advantaged in terms of household income; 8 target boys, 8 target girls)	24 families (13 'more' and 11 'less' advantaged in terms of household income; 11 target girls, 13 target boys)	14 families (SES distribution roughly in line with national average; 7 target girls, 7 target boys)
Methods used to inform case studies	Based on interviews and observations during two visits to families	Based on interviews and observations during five visits to families	Based on interviews and observations during nine visits to families, plus 3 rounds of mobile phone diaries from 11 families
Additional forms of data collection	Survey of 400 families from 8 preschools (50% response rate); interviews with primary school teachers from 4 schools on expectations of children's ICT competences on entry to school	Survey of 800 families from 4 local authorities (45% response rate); expert forum of key policy makers and practitioners	Case-studies of specific technological toys based on further visits and videos by sub-set of 4 families

APPENDIX A - Descriptions of three research projects

All of the participants in our research projects lived in central Scotland, an area which includes the conurbations of Edinburgh and Glasgow as well as small towns, former mining villages, and semi-rural communities. All the children in our studies attended preschool, typically for a morning or afternoon session, although a minority of children attended for a full working day. Preschool education in Scotland is provided for children aged between three and five, with almost all (96 per cent) four-year-old children in part-time preschool education funded by the government and provided by the public, private or voluntary sectors (Scottish Government 2009). Families were recruited by distributing leaflets at nurseries serving disadvantaged populations and selected by us, initially by postcode, to meet predetermined criteria. We refer to parents throughout this paper but in some cases this refers to adult caregivers who took a parental role in the household.

Already at a Disadvantage? Children's access to ICT at home and their preparation for primary school

This small-scale project was conducted during 2003-2004. It ran in parallel with *Interplay*, an ESRC-funded study which investigated the ways in which children's learning with technology can be supported in preschool settings, and provided case studies of 16 children from nurseries involved in that project, enabling us to look at their experiences across home and preschool. It also featured interviews with primary school teachers about their expectations of children's ICT competences as they enter school, their knowledge of children's ICT experiences at nursery and at home, and how this influences formal provision. 'Disadvantage' was defined as households with an income which was less than 60% of the national average.

Entering e-Society: Young children's development of e-literacy

This two-year project (2005-2007) investigated parents' expectations and aspirations for their children's futures as users of technology, provided observations of children using technology at home, and considered the extent to which a digital divide is emerging between young children who have opportunities to make use of technology and those who do not. The project included consultation with a range of education professionals on the implications of the project's findings for early years education. For this project, 'disadvantaged' families had an annual income of less than £15000 and were living in socially deprived areas and 'more advantaged' families had an annual income over £20000 and were not living in socially deprived areas.

Young children learning with toys and technology at home

The focus of this three-year project (2008-2011) was on play at home, particularly with technological and traditional toys. It produced in-depth case studies of fourteen families and traced children's play experiences at home over the course of a minimum of nine rounds of data collection based on visits to fourteen households in the period from June 2008, when children were three years old, to October 2009. Each round had a specific focus, such as parental recollections of their own childhoods, the toy audit and conversations with children about toys and technology, parental perceptions of their child's play and learning, mobile phone diaries to illustrate 'typical' days for these families, and family interviews about the changes brought about by the transition to primary school.