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exploring preschool children's encounters with ICT at home

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ABSTRACT

This article is an account of our attempts to understand preschool children's experiences with information and communication technologies (ICT) at home. Using case study data, we focus on what we can learn from talking directly to the children that might otherwise have been overlooked and on describing and evaluating the methods we adopted to ensure that we maximized the children's contributions to the research. By paying attention to the children's perspectives we have learned that they are discriminating users of ICT who evaluate their own performances, know what gives them pleasure and who differentiate between operational competence and the substantive activities made possible by ICT.

KEYWORDS *preschool children, research methods, using ICT*

introduction

This article is an account of our attempts to understand preschool children's perspectives on their encounters with information and communication technologies (ICT) at home. We are drawing on data from *Entering e-Society*, a longitudinal, Economic and Social Research Council (ESRC)-funded study. The main aims of *Entering e-Society* were (i) to investigate the early development of e-literacy and the competencies that children develop with and through ICT at home, and (ii) to explore parents' understandings, expectations and aspirations concerning their children's entry into e-society. In addition, we were interested in the factors that support or hinder children's developing e-literacy and the extent to which a digital divide is emerging between children who have extensive access to new technologies and those who do not. In this article we are focusing

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on the nature of the children's experiences as they described them. We will draw on case study data to illustrate the ways in which the children interacted with the technology and in particular

- to explore what we have learned from talking to the children that would have been overlooked if we had not consulted them directly;
- to describe and evaluate the methods we adopted in order to add to the repertoire of research techniques that assist in the articulation of children's perspectives.

We have adopted the same broad definition of ICT that we found made sense in terms of young children's experiences as we explored them in *Interplay*, our earlier study of children's engagement with new technologies in the preschool playroom (Stephen and Plowman, 2007). By ICT we mean not only desktop computers, laptops and peripherals but also interactive television, digital cameras, video cameras, DVDs, mobile telephones, games consoles, electronic keyboards and toys that simulate 'real technology' such as toy laptops or barcode readers (Plowman and Stephen, 2006). This definition allows us to incorporate technologies that are both interactive and communicative and which are particularly appropriate for preschool age children because they do not rely on using text or a keyboard and are more ergonomically suited for three- to five-year-old children. These technologies are present in many preschool playrooms and represent the range of resources available at home. A survey of parents of children attending ten nurseries in four local authorities across Scotland (carried out at in the initial stages of *Entering e-Society*) confirmed the ubiquitous presence of television and mobiles phones in the homes of young children and the widespread but not universal access to computers and the Internet that they enjoyed. All of the respondents reported having at least one television in their home (three-quarters of which were interactive), 97 per cent owned a mobile phone and there was a computer with Internet access in 70 per cent of the homes.

Our theoretical framework draws on the Vygotskian socio-cultural tradition which sees learning and development as mediated through interactions with others who are more experienced or knowledgeable (Schaffer, 2004). We have conceptualized the interpersonal interactions which support learning with ICT in preschool settings as guided interaction (Plowman and Stephen, 2007). At home, children's developing understanding of and competence with ICT can be supported by interactions with their parents, siblings, peers and other family members. But the technology itself is also an influential component of the child's experience. We think of children as active agents in the social and cultural setting of home, contributing both to reproduction of the social world and to societal change through the new cultures which they create (Corsaro, 1997). We recognize that children have particular understandings of their

world, their own perspectives on their experiences and that they make choices between activities based on individual preferences (Stephen, 2003). Because we are aware that individual children make sense of the actions of others and can decide on their own activities, we considered it to be essential that we extend our enquiry beyond adults reporting on children's experiences. We have employed methods that include children directly and have made space for recording their experiences with new technologies at home in their own terms, in addition to our adult-centric research questions and concerns (Formosinho and Araújo, 2006).

In the sections which follow we will describe our research methods then give an account of the evidence which we gathered from children. We conclude with an evaluation of the benefits of attempting to access young children's perspectives directly and of the methods that we used to explore children's points of view.

the research process

research design

Following the initial survey phase *Entering e-Society* adopted a case study approach. We originally selected 24 case study families from those who volunteered through the survey form. In making our selection we were keen to achieve a mix of technology rich and technology poor households (defined by the number of resources giving digital connectivity they owned), variation in family composition, a range of socio-economic advantage and disadvantage and some geographical spread. Of the 24 families, 19 remained with us until the end of the case-study phase. Three families moved away and were lost to the study after one or two visits. Two other families had to withdraw in the course of the study for other personal reasons. The data from children reported in this article come from the 19 volunteer families who remained in the study throughout the 18 months of data collection. The characteristics of these families are set out in Table 1.

The five rounds of data collection were conceived as an iterative process that allowed us to respond to emerging issues. For example, because it became clear in round 1 that the ways in which parents responded to the new technologies

table 1 characteristics of 19 case study families at the beginning of the study

Gender of focal child	8 (42%) female; 11 (58%) male
Age	6 (33%) age 3; 12 (63%) age 4; 1 (5%) age 5
Technology status	10 (53%) 'technology rich'; 9 (47%) 'technology poor'
Family composition	4 (20%) no siblings; 8 (63%) older siblings; 7 (37%) younger siblings; 0 both older and younger siblings
Socio-economic status	12 (63%) advantaged; 7 (37%) disadvantaged

available for their children was influenced by their own early experiences of ICT we explored this history further in round 2. Two researchers were involved in each visit. One conducted the interview with the parent (always mothers, with the exception of two households where both parents were sometimes available) while the other took notes to supplement the audio recording and talked to and played with the preschool child or his/her siblings as opportunities arose.

table 2 data collection processes

June and September 2005	Parents of preschool children	Survey	demographic information; home ICT audit (resources and use); attitudes to ICT and children's use
July–October 2005	Case Study Families Round 1 – *Parents*	Interview	demographic information; ICT audit; family usage of ICT
December 2005–January 2006	Case Study Families Round 2 – *Parents*	Interview	parents' educational background & experience of ICT at school, work and home; child's experience of ICT at nursery; attitudes to ICT use & expectations for future
March–June 2006	Case Study Families Round 3 – *Parents & Children*	Interview – parents Discussion with parents and children of photographs Video recording of child's demonstration	*Parents*: child's use of technologies & ways learned to use them *Child*: reactions to technologies in photographs *Child & parent*: demonstration of child using technology.
June–July 2006	Case Study Families Round 4 – *Parents & Children*	Interview – parents Mapmaking – children	*Parents:* child's non-technological activities; preparation for transition to school *Child:* mapping location of technologies in the home
November 2006–January 2007	Case Study Families Round 5 – *Parents & Children*	Interview – parents Activities – children	*Parents*: change in ICT owned or way used; family rules for ICT use; experience of transition to school where appropriate & ICT use at school; *Child*: activities to articulate child's perspective on using technologies and learning to use ICT

The focus of our exploration in each round is described in Table 2. Our research methods reflect two key aspects of our approach to the study. First, we recognize that children have valuable perspectives on their experiences that have to be taken into account if we want to make sense of their interactions with ICT (Dockett and Perry, 2007). Second, we are aware of the need to assist the articulation of the children's perspectives by adopting techniques that respect their preferred methods of responding and interacting and ensuring that they are comfortable with the presence of the researchers in their homes (Smith et al., 2005). Our aim was to use activities that were both appealing to three- and four-year-olds and which offered them ways of expressing their perspective that had face validity for the children and their parents and which were within their existing behavioural repertoires (Christensen and James, 2000).

Although the children were often present during our interviews with their parents in rounds 1 and 2 we did not seek to involve them directly until the third round, conducted about six to eight months after we first met them, when they were more comfortable with the researchers being present in their homes. We had given an 'instant picture' camera to each family on our second visit with the request that they take some photographs of their child playing with ICT. Our direct conversations with the children began with a discussion of these photographs during our third visit. While the children talked about the photographs their parents usually sat near by, commenting on or elaborating on the child's response. At an appropriate point in our conversation about the photographs we asked the child to show us how they used an item of technology, allowing them to choose what to demonstrate. These demonstrations were video-recorded and analysed in terms of the interactions with parents and siblings that supported the children's use of the technology (Plowman et al., 2007).

The focus of our interactions with the children in round 4 was a mapping exercise that was designed to explore where children used the technologies in the home and under what circumstances. For instance, we were interested in the extent to which they shared the use of some technologies with other family members or were exposed to parents or siblings modelling ICT use. The children were invited to use pre-prepared stickers representing items of furniture and technology to create 'maps' of rooms in their homes. (see example in Figure 1). With assistance from the researcher the child selected appropriate pictures and placed them on a sheet of paper for each room. As with the photographs in round 3, we were interested in (and recorded) the conversation around this activity as well as the visual images produced.

By round 5 we had known all of the children for over one year and some for as long as 18 months. They were now very familiar with one member of the research team who had attended every interview with each family over the past year. We capitalized on this familiarity and the researcher's ability to establish a comfortable relationship with each child by ensuring that she conducted our

figure 1 living room map showing location of TV, DVD, hi-fi and camera

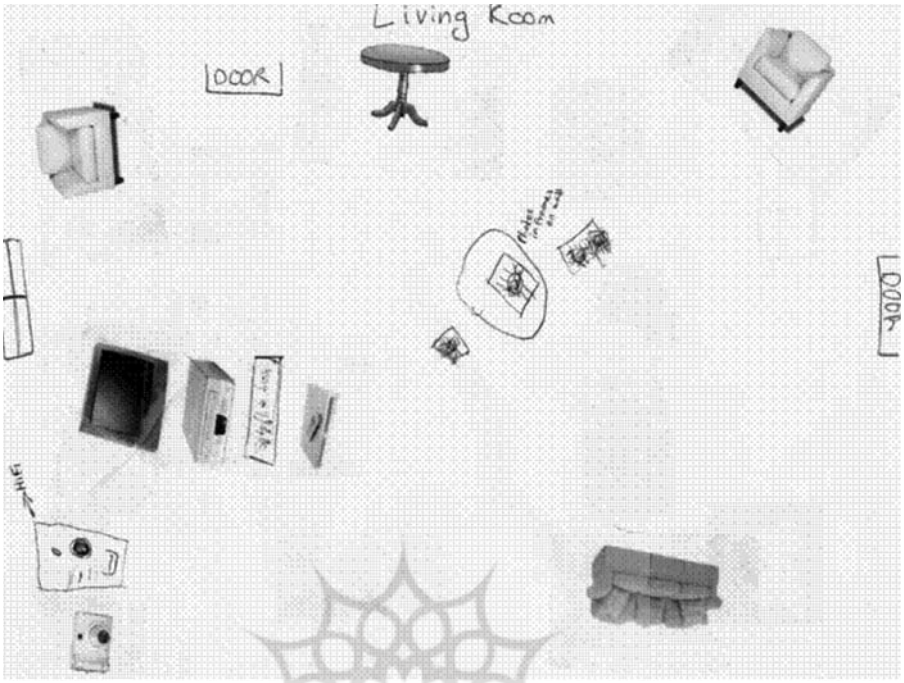
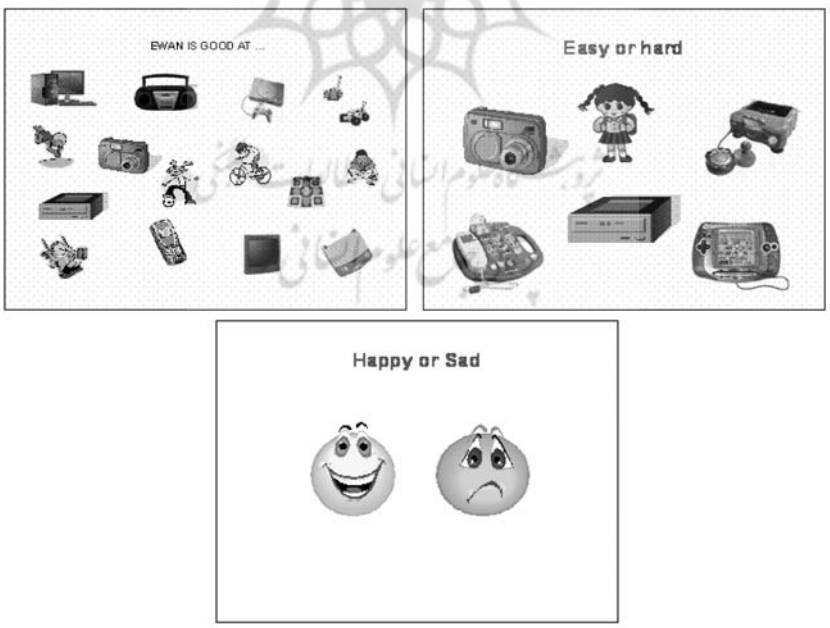


figure 2 examples of materials used in activities in round 5



final data collection activities with the child. The second researcher on that visit conducted the interview with the parent, usually in an adjacent room. The children were invited to take part in three tasks in this round: (i) using stickers from a given range to indicate which activities they felt that they were good at; (ii) discussing how easy or difficult it would be for another child the same age to learn how to use some technologies; and (iii) sorting a range of technological and non-technological activities into those which made them happy and those which did not. The nature of these tasks is described in more detail below (all names used are pseudonyms).

analysis

The process of analysis depended on the particular form of data involved. In general conversations with children about photographs, maps and their choices in the round 5 activities were subject to content analysis by combing for evidence of individual preferences, family practices and children's constructions of the use and functionality of ICT resources at home (Edwards, 2001). Evidence from parents about their child's use of ICT at home and nursery and enduring and changing interests was used to add to and contrast with the child's own perspective in each case study. From the sorting and selecting activities in the final round we were able to learn more about children's constructions of competence and difficulty with ICT and their expectations about school and ICT use there (for those who had been on an introductory visit). Individuals' likes and dislikes amongst technological and non-technological resources in the home were collated across and within cases.

ethics

As this study involved gaining the confidence of parents and young children and repeated visits to families in their own homes ensuring that it was conducted ethically was a key concern. The ethical guidelines from the British Educational Research Association and the Scottish Educational Research Association underpinned our processes but the research team were careful to consider the implications of the methods employed throughout the design, execution and dissemination of the study.

Our initial survey included an invitation to families to consider taking part in the case studies. This was distributed through preschool settings but practitioners were not involved in collecting the completed surveys nor did they know who had volunteered to participate further. Parents themselves acted as gatekeepers to their homes and children, volunteering their contact details directly to the research team when they returned the survey. Like Flewitt (2005) we considered all consent to be provisional and dependent on the evolving relationship between

the families and the research team. We were careful to ensure that visits were arranged at times that were convenient to families, to re-arrange appointments on request at very short notice and to check if parents and children were willing to embark on each new round of data collection. As it was possible that parents might feel bound by social conventions to continue we offered them opportunities to withdraw during our telephone conversations and through the use of a card which they could return to the research team. Some families went to considerable lengths to contact the research team, re-arranging appointments or re-organizing the family schedule around our research visits.

Parents were offered assurances of anonymity and confidentiality that included secure storage of all data. At the beginning of each visit we sought written consent from parents for each element of data collection involved on that day (e.g. audio recording, video recording, talking to children). Explicit agreement was sought to use still and video images in a range of specified dissemination activities and we have been careful to respect the decision of one family to refuse permission to use video images from their home in any way other than for analysis by the team.

We have two forms of consent to participate from children. The first is verbal. We asked the children if they were happy for us to talk to their parents about how they used ICT. However, given the imbalance in power between adults and children in these circumstances and the pressure of social conventions the opportunity for children to refuse consent has to be questioned. We therefore treated their agreement at this stage as assent rather than consent. The second form of agreement is behavioural, expressed through the child's willingness to engage with the activities we introduced. When we invited the children to take part in tasks and conversations there was more opportunity for them to withdraw their participation by failing to respond or complete the tasks if dissatisfied or unhappy with the experience.

findings: the children's evidence

making choices: likes and dislikes

The evidence from parents suggested that most children were acquiring competencies with a range of technologies at home and that they enjoyed using both ICT and more traditional toys. This picture was endorsed by the data gathered directly from the children. The images presented for children to sort into 'happy day' and 'sad day' lists were drawn from activities that they or their parents had mentioned in previous interviews. Their choices suggest that the children enjoy physical activities outside and new technologies indoors. About half of the children selected swimming and playing on a garden or playground slide as activities which would make them happy. Over two-thirds of the children placed the computer on the 'happy side' and over half made the same decision

about television. Drawing, watching DVDs and riding a bike were also popular choices. The children's preferences indoors suggest that new technologies are a favoured source of entertainment. Television and DVD players are an obvious source of entertainment while games on the computer (particularly the *CBeebies* site) are engaging and fun, regardless of whether they are designed with learning or entertainment in mind.

Some children had already developed enduring interests in particular topics or forms of play which were reflected in the technologies which they favoured. For instance, Kenneth's interest in racing cars predated his use of ICT. He often told the researchers about visits to car shows with his father and was always keen to show us his collection of toy cars. He talked about liking to watch cars on television, using his remote control cars and taking photographs of cars at shows. Alex was fascinated by any sporting activity, including playing football with friends, and his interest was encouraged by his family. Alex watched sport on television with his family and was drawn to computer and interactive TV games that involved sport. He had become a proficient player of games primarily designed for older children and adults on a BBC website. As he demonstrated how to play the hurdling game Alex acted out the movement of arms and legs with his body.

In some cases children said that they placed a particular technology or traditional toy on the 'sad' side because they found it boring or they recalled an incident when there had been a problem or difficulty (e.g. falling from a bicycle, difficulty getting off a swing). More commonly activities and resources placed under the sad face were described as 'too hard'. Swimming, reading and football were all described as being hard by individual children but this characteristic was most commonly attributed to ICT activities which they associated with negative emotions. Being 'too hard' was sometimes a result of difficulty with operating the technology. For instance, Lynsey, Kenneth and Grace drew attention to difficulties with the controls.

> Might have trouble with the remote . . . (*Lynsey)*

> [It's] hard to move the arrow because sometimes you can't get the arrow to move . . . *(Grace)*

> using the controller [for the Playstation] can be hard because there are so many buttons it's hard to use them all at once. *(Kenneth)*

Alternatively, the difficulty could lie with the nature of the substantive activity. Children found particular versions of computer games too hard or too long. For instance, Angus explained that he didn't like the alphabet game because it was too hard.

> [It's hard] because you have to get up on the rocks. *(Jason, referring to a game on the V Tech Smile)*

> [It's hard] because you've got to try to use the white one to get the balloons to burst them . . . you've got to catch them. *(Grace, referring to Disney Plug 'N' Play)*

Our evidence suggests that children are not indiscriminate players of computer games and that some products failed to capture their intrinsic interest or were inappropriately targeted. For example, Andy demonstrated considerable operational competency with his Gameboy but he went on to explain that sometimes it was boring. Although the children were generally reluctant to admit that they got stuck with games sometimes their conversations did indicate that they did give up on occasions. When the researcher asked if he ever got stuck, Angus replied

> No . . . I just go on to a different game. I don't get stuck at all on that game, the one where they get bigger or smaller. *(Angus, referring to playing Internet computer games)*

Parents were sometimes surprised at the children's negative comments about ICT. Particular incidents or activities featured much more highly in children's evaluations than they did with parents' who were inclined to assume a generalized interest in and competency with new technologies on the part of their child, while underestimating the degree of adult or sibling support that children need to achieve this apparent competency.

judging competencies

When the children were invited to indicate which of the non-technological and technological activities they were good at the results suggested a considerable degree of differentiation on their part. They did not want to place stars by every picture available but were ready to be selective in ways that were not always mirrored by their parents (who tended to be positive about any interactions that their child had with ICT). The children were frequently confident about their abilities at football, swimming and going on swings and bike riding. They often chose drawing as another activity that they were good at, some indicating that they were good at this at home and others who had begun school by round 5 suggesting that they were good at drawing in the classroom too. Andy said that he was good at drawing at school but liked other things better at home.

The children marked a wide range of items from the technologies list as things they were good at using. Although not the most commonly available resource at home Playstations made up 21 per cent of the items children selected as ICT they were 'good at'. The next most frequently selected 'good at' items were computers and LeapPads, followed by television and remote control cars. The relatively small percentage selecting computers is notable because the data from parents suggested that this figure would be much higher (although, as we have suggested above, parents may underestimate the amount of guided interaction needed for success). The favourable evaluation given to Playstations also contradicts adult

expectations as Playstations are often seen by them as difficult for children to operate and a less appropriate resource for young learners to use. We have no way of assessing the accuracy of the children's perspectives and those of their parents but these data suggest that, at the least, children's understanding of 'being good' at something deserves further exploration. The children's judgment may involve a degree of aspiration as Playstations are high-status resources, often belonging to older siblings, while computers may be seen as an everyday family resource. In other cases their perspective on competence may represent the degree to which they feel dependent on others to use the computer or recognize their limitations at particular games. Catriona mentioned that she was good at the *Bob the Builder* game (not the only game available to her) while Freddie described himself as failing with the *Toy Story* game ('I die on that one, its rubbish, too hard') but good at the *Pokemon* game which he can do himself.

ICT and family relationships

During the mapping activity children told us about restrictions on their use of resources (e.g. not being allowed to use the main hi-fi in the living room) and which technologies they moved around the house or stored in particular places so that they could be readily found or kept away from younger siblings. In the course of this activity they also told us about the activities and resources that they considered that they shared with older siblings. Catriona told the researcher about a game on the computer that her brother showed her how to play and how she joined him in his room to watch videos. In Grace's home the Playstation belonged to her brother and was kept in his room. Alex suggested that he was able to share his sister's Playstation and that he played with it too much (something his mother later endorsed when she explained that she was going to ration Alex's use of the Playstation).

As they described where things were kept at present the children mentioned items they had outgrown, sometimes speaking with evident distain for items they now regard as childish or boring. Catryna told us how she no longer used the Barney Dancemat and that although her sister's LeapPad was in the loft she did not think that she would want to use it. Alison explained that she had given an alphabet game to her younger cousin as she was too old for it now. The children's conversation presented ICT in the home as resources to be grown into and out of like toys or clothes, with the items possessed by the older child having higher status. We had incidental evidence of this trend from younger siblings too when, for example, they rejected pretend mobile phones in favour of more realistic models used by their older siblings or sought out the fully functioning mobile used by their parents, despite their own inability to operate it in any effective way.

learning to use ICT

The children responded readily to the prompt to discuss how another child like them could learn to use a range of technologies. Their responses demonstrate a clear expectation of age appropriateness for particular ICT, although whether this is 'received wisdom' or based on experience remains unclear.

> Easy for Ben to use as he is five and getting big. *(Alex, referring to mobile phone)*

> Easy! Because he can do it . . . At his age he is able to do that. *(Kenneth, referring to remote control car)*

> Could learn to write texts and take pictures but not until he is bigger . . . could learn to play games on it now if Mum showed him where they are. *(Angus, referring to mobile phone)*

Children's explanations of what was needed to access the technology were couched in terms of routines such as press this and then click on that but there was little evidence that the children's understanding went beyond a well-practised sequence to an appreciation of why the operations were necessary.

> you just press a wee button at the bottom and it will come on . . . and then you have to click on the Internet and then you press the wee word. Then it will be a long line and you look for *CBeebies* and then you just click on it and it comes up. *(Catryna, referring to CBeebies website)*

They were considerably more likely to suggest that another child would need help with the initial operational features rather than the actions required to engage in the substantive activity. It seems possible that once children had reached the menu on a computer game completing the activity by using the cursor and mouse was easier than controlling a pencil, manipulating other small tools or three-dimensional resources such as jigsaw puzzles. Parents were the most frequently mentioned source of support although some children suggested that brothers, sisters or cousins could help too. On no occasion did a child suggest that teachers or preschool practitioners could be turned to as sources of help with ICT.

> Mum and Dad could show her which buttons to press and then she could use it on her own. *(Evie, referring to LeapPad)*

> [He] could pick it up quickly with [his] mum's help . . . showing him how to switch it on, click on his name on the icon then click on the Internet . . . On Cartoon Network he can do what he wants to do. *(Angus, referring to computer use)*

> You can take pictures by pressing buttons . . . his mum or dad will show him. *(Colin, referring to digital camera)*

When it came to learning how to read the children seemed to view this as a more daunting task (even by the end of our study the oldest children were just

being introduced to reading in the first months of primary school). All but two of the children who commented on learning to read considered it to be hard and, although parents were the most mentioned source of help with reading, over half suggested that going to school and teachers could also help.

discussion

what did we learn from the children?

One aim of this article was to explore what can be learned by consulting directly with preschool children about their experiences with and perspectives on using ICT at home. We initially saw our direct conversations with children as throwing light on what ICT they used and addressing questions about the existence of a digital divide. However, as a result of the data collection activities with children in round 5 of the research process we have a picture of the case study children as discriminating users and evaluators of their competencies with ICT. The children differentiated between operational competence and the games or activities that mastering the functions permitted, sometimes describing the operation of the technology such as a computer as easy while at the same time considering that particular games were hard.

Despite assertions commonly found in popular discussion (e.g. Abbs et al., 2006; Palmer, 2006; Sigman, 2005) there was no evidence that ICT dominated the preferences of children. All the case study children nominated traditional activities (particularly outdoors physical play) among the things that they enjoyed and were good at. Their reflections on their use of ICT made it clear that they stopped using a resource if it was boring or too hard to be pleasurable. Their family's habitus (practices and culture) did make a difference to children's engagement with ICT (Brooker, 2002; Tomanoviæ, 2004). Family values, orientations and expectations influence spending decisions, the balance struck between play with traditional and technological toys and the rules for engaging with new technologies in the home. Nevertheless, although children could be drawn into using particular ICT by parents and older siblings, if they were not attracted or found this play difficult they could remain resistant or select only those aspects that appealed to their enduring interests. In some cases children developed an interest in or competence with a particular technology outside the home (through interactions with their extended family or friends) which challenged or initially outstripped their parent's use of the resource.

Maddock (2006) characterizes the older child's agenda for out of school activities as being 'because of', contrasting this with the adult 'in order to' agenda. 'Because of' seems to apply equally to the way in which the young children in our study talked about their engagement with ICT. Typically they talked about their favoured activities in terms of pleasure, fun and being able to succeed

(and they were reluctant to take part when the game was difficult or required knowledge that they found challenging). In telling the researcher about their use of a resource children usually offered some description of the operation of the equipment then moved on to talk about it in terms of enjoyment or fun rather than the purpose or goal of an activity. Using ICT at home was perceived as a leisure or play activity, not a learning activity or part of 'educational work'.

The responses of the case study children support the construction of them as active agents who make choices and evaluate their performances and who appropriate the aspects of technology that give them pleasure or apparent access to increased status. On the basis of our evidence we suggest that developing e-literacy in preschool children is primarily driven by social and emotional needs, becoming part of the local culture through shared experiences (Rogoff et al., 2003) and the urge to develop understanding that is an 'essential motivation' for human beings (Trevarthen, 1998).

The children's answers to questions about how another child could learn to use particular technologies suggested that they saw some kinds of learning as happening at home and some at school (with little mention of learning in relation to preschool settings). The majority of children who responded thought that learning to read was an activity that should occur at school and with a teacher but when it came to learning how to use ICT parents were the most frequently nominated source. This finding reinforces the suggestion that young children see learning to use ICT as entry into shared and current family practices, rather than knowledge or skills to be acquired as part of an external, adult-directed agenda such as they will encounter in school. Whether these shared funds of knowledge built up at home (Moll and Greenburg, 1990) can be drawn on productively when children make the transition to primary school is a matter for speculation. Evidence gathered earlier (McPake et al., 2005) suggested that teachers were not likely to value the ICT experience and expertise that children bring with them, seeing home activities only in terms of 'playing games' and preferring to 'start from scratch' when teaching ICT activities in school. As one case study mother reported after a visit to her son's future primary school, he will be taught how to use the mouse and keyboard 'properly' there.

evaluating our research methods

Earlier in this article we described the research methods which we chose in order to ensure that we could capture children's perspectives in ways that maximized their potential to contribute to the research. Three particular features of our approach were selected with this aim in mind: i) we waited until we thought that the children would be familiar and comfortable with the research team visiting their home; ii) we used forms of responding which were within the repertoire of young children, for example, using stickers, sorting pictures (Woodhead and

Faulkner, 2000); iii) the researcher responsible for the consultations with the children adopted a way of interacting with them which we hoped presented her as a friendly visitor, interested in each child but with a distinct purpose to her visit (Christensen, 2004).

By the end of the research process our experiences and the quality of the children's evidence have left us feeling confident that we made good progress towards our goal of developing techniques that enhance children's contribution to the research process. The children did engage with the research team in ways that suggested that they were comfortable with the researchers' presence and expected the adults to be interested in what they said and did. They greeted the researchers, showed them toys, invited them to join in activities and talked to them about matters beyond the research remit. Inevitably on some occasions a particular child felt tired or unwell and was less inclined to interact with the researchers and some children were more outgoing than others. Nevertheless, we were able to support each child in making some contribution to the research process. By round 5 all the children were happy to move to another area of the room or to an adjacent room to complete the activities with the researcher with whom they were most familiar. They co-operated readily with her requests and often went beyond what they were asked to do in ways that made it clear that they were confident that she would be interested in what they were doing (for example, drawing pictures for her to take away or demonstrating new skills such as writing their name). Our efforts to establish warm relationships with parents also contributed to our positive relationships with children. When their parents were comfortable with the visits of the research team the children were more likely to feel confident and happy to engage with us.

Talking about photographs which their parents had taken at home proved to be a successful way of beginning our research conversations with the children. We had planned to discuss the photographs with parents first before moving on to include the children but they often intervened. They were aware of the photographs having been taken and many seemed ready to assume the role of a central informant. They held the photographs and chose which ones to talk to us about, in which order, for how long and when to move on to another picture. The children responded with interest to the mapping task and with pleasure when they recognized the items depicted on the stickers as ones present in their homes. This activity offered the additional advantage that less talkative children were able to engage without the need to respond verbally. The tasks used as a way of prompting and structuring the conversations with the children in round 5 were readily understood and required little introduction. Using stars and stickers is a familiar way of responding and making choices for three- to five-year-olds and the elaborated responses of children to the questions about how easy it would be for another child to learn to use ICT suggest that this was an activity well within their repertoire.

Hill (2005) sets out four points of guidance for qualitative researchers seeking to understand the perspectives of children, arguing that ethical research should:

- contribute directly or indirectly to children's well-being;
- avoid any stress or distress;
- allow children to feel positive about their involvement as a contribution to society;
- ensure that children can make informed choices about taking part and contributing to the research agenda.

When the research participants are as young as three years old it is difficult to ensure that they appreciate issues of confidentiality, the research agenda and their potential contribution to society and we have had to rely on parents to act as gatekeepers for their children for these matters (Makin and Whiteman, 2006). We were careful to ensure that children did not experience any distress and are confident that this was avoided. We did not approach children until they indicated a readiness to interact with us and always ended any interaction if either the child or parent may have been likely to experience any stress. For instance, if a child was failing to demonstrate some use of ICT which their parent suggested was within their repertoire we moved the discussion to another topic.

Our study will have only indirect benefits for the well-being of children at the level of society but participating in the project seemed to offer direct, short-term benefits to the children involved. We were able to observe their pleasure as they showed photographs to the research team, made maps and took part in the round 5 activities. These benefits were enhanced by three gifts which we gave to each participating family: a modest gift voucher for a children's shop; an 'instant' photograph camera and additional film; and a certificate congratulating and thanking each child for being a 'research helper'. Both children and parents seemed to value the carefully presented certificate which we gave at the end of the final home visit, often saying that they would put it on child's bedroom wall or take it to nursery to show to staff.

As to making choices about taking part we have described above how we considered the initial verbal agreement of each child as only provisional assent. Children were always invited to take part in each activity and could either say no or fail to complete the activity (a response which is more likely than verbal refusal given the power differentials between parents, researchers and young children). Although children in our study did not say that they did not want to take part we were aware of some instances when a child indicated through their behaviour and body language that they were tiring of the activity or wished to stop to move on to something else, for example, going to play with a friend. While parents sometimes tried to persuade the child to continue, the researchers were keen to respect the child's desire to end the interaction.

Evaluating the effectiveness of our research methods in terms of their ethical impact is difficult as it is more properly the children or others who should make this judgement. We did of course have scrutiny from our departmental ethics committee and the endorsement of parents who permitted (and apparently welcomed) repeated visits to their home. However, it is the willing responsiveness of the children which gives us most reason to believe that our attempts to act with integrity and sensitivity towards them were effective. As to the value of including evidence directly from the children, the picture which emerges of children as active individuals, making choices, aware of their preferences and relative success and gaining pleasure and involvement in family life from their engagement with ICT suggests that consulting the children is not only heuristically beneficial but a necessity if we are to understand their experiences with new technologies. Attending to the children's evidence has made us aware of them as discriminating users of ICT who evaluate their own performances, know what gives them pleasure and differentiate between their operational competence and their ability to engage with the activities that ICT makes possible.

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